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# CHEMICAL AGE

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## U.S. POLYTHENE PROBLEMS

**O**VERCAPACITY in U.S. polythene production has been noted before in *CHEMICAL AGE* and it now appears that U.S. producers are themselves expressing concern about it. Throughout the world many new plants have been, are being set up, or are planned to produce conventional and low-pressure polythene.

The U.S. home market for polythene has developed rapidly and capacity is a little over 1,000 million pounds (four-fifths conventional and one-fifth low-pressure). There are 13 producers of polyolefins and 23 plants. Thirteen plants are, or will be, producing conventional (i.e. high-pressure) polythene, four are Ziegler-type plants and four are Phillips-type plants and two are polypropylene plants.

Production of polythene in the first three-quarters of 1958 totalled 623 million lb., a 25% increase over 1957's record level (*Chem. and Engng. News*, 1958, 36, No. 49, 19). For the year it is estimated that the total will be 850 million lb. Sales as at 30 September last reached 592 million lb., also a 25% increase over those of 1957. Exports for the year are expected to reach the 225 million lb. mark as against 191 million lb. last year. Exports, in fact, are reckoned as taking 30% of industry sales.

For 1959, production is estimated at a little over the 1,000 million-lb.-mark (if all goes well). Domestic capacity next year is put at 1,300 million lb. which means a 30% overcapacity by the year end.

U.S. polythene producers are, in the main, exporters of the plastic. Film accounts for the largest share of the export market sales. But leaders in the industry see a fall in polythene exports. Nearly every major producer, reports *Chem. and Engng. News*, believes there will be a 10% drop for the industry's exports next year and some even suggest a 15% fall. By 1961-62, polythene exports, according to a spokesman of Spencer, will fall to 90 to 100 million lb. annually.

Recently the U.S. producers have been going all out to woo their overseas customers and to encourage confidence in their products. Very much in mind is the European Common Market and the now apparently abandoned Free Trade Area. Despite the new plants in the U.K. and Europe there will be under 250 million lb. capacity in operation in 1960, and thus the market on the Continent will be larger than the available supplies—a hopeful situation for the U.S. polythene manufacturers. Also in favour of the U.S. is the dropping by the U.S. Government of its requirement for export licenses to ship polythene and the recent decision of the polymer arbitration tribunal in the U.K. not to classify polythene and some other plastics raw materials as synthetic organic chemicals (see *CHEMICAL AGE*, 15, 22 and 29 November and 6 December).

Other hopeful export factors in the eyes of U.S. producers are: their production of ethylene is cheaper than ethylene derived from refinery-cracking or coal in Europe; half the world's new capacity is for low-pressure polythene which is not so widely used as yet for film extrusion; and new plants take time to build and to come into production.

In the polythene field, the U.S. producers have not, like U.S. pharmaceutical producers, set up affiliated companies in the U.K. or on the

Continent to any extent. The U.S. companies feel, in all probability, that it is too late to put up plants in the European Common Market area.

It may be, too, that, because of the developments in the polyolefin field, U.S. producers feel that further expenditure on polythene may not be warranted. Polypropylene plants are already functioning in the U.S., Italy and Germany. Moreover, the position with regard to polypropylene manufacture in Europe is very much in the hands of Montecatini (see *CHEMICAL AGE* last week). Certainly the patent situation is tricky.

From recent reports, however, it seems that although polythene and polypropylene are featured prominently at the present time, some newer polyolefins are well on the way; in particular, ethylene-propylene copolymers and polybutylene. U.S. companies interested in these are Hercules Powder and Spencer Chemical. Hercules say that they have obtained interesting results with copolymers and with poly-

mers above  $C_3$ . Spencer have recently referred to polybutylene and olefin copolymers, although this company reports that polymers beyond  $C_4$  do not hold much promise.

Montecatini are known to have plans to produce ethylene-propylene copolymers. They have certainly stated that part of the propylene from two new cracking units, in combination with ethylene, will be used as source material to produce other 'unique and revolutionary products.'

Professor Giulio Natta, who is very much concerned in Montecatini's plastics materials developments, has said recently that  $C_2$ - $C_3$  copolymers are more interesting elastomers than polyisoprene or polybutadiene, the two polymers favoured in the development of natural type synthetic rubbers. He has also referred to crystalline and amorphous forms of polybutylene, the degree of crystallinity of which can be controlled by the right catalysts. We expect that 1959 will bring more news of these new plastics materials and of plans for their development.

## D.S.I.R.'S ILL-ADVISED DECISION

**WHAT** has made the Research Council of the Department of Scientific and Industrial Research decide to disperse the microbiological group at the National Chemical Laboratory, Teddington? On p. 1023, the statement issued by the Research Council and the statements issued by the Institute of Biology and the Institution of Professional Civil Servants are given.

The decision has been described by Mr. J. H. Bunker, hon. secretary of the Institute of Biology as 'a national tragedy.' The break-up of this microbiological team which started its work in 1933, can only be regarded as most serious and ill-advised and moreover it could harm the national economy. Even more disconcerting perhaps is the thoroughly unorthodox manner in which the affair has been conducted.

The ways in which D.S.I.R. has proposed that some of the group's work should be continued should be considered. The decision to send the national collection of industrial bacteria to the Torry Research Station at Aberdeen is unreasonable and shows a very real lack of appreciation of having a culture collection in an accessible spot. As Mr. Bunker noted, 'the collection cannot be treated like pressed flowers kept in the family Bible or the goods in a grocer's shop.' It is essential that such a collection be kept in an accessible place. Most of the requests in the U.K. regarding it come from the South. Also it needs experts to look after it.

The joint statement is outspoken about the proposal to offer research grants to universities. Until recently the only people working on sulphur-producing bacterial were the Microbiology Group. The present programme of the group and the five-year plan drawn up by the Advisory Committee on Microbiology is inappropriate either to universities or industry.

Fundamental studies on methane bacteria have already been 'dabbled in' by universities, and abandoned because of difficulties. Such work can only be carried out by workers with long-term security of tenure. The work is laborious and time-consuming, and gives few opportunities for publication. In these circumstances, such work would not be welcomed by the universities.

These investigations and those on thiobacilli, as was indicated in *CHEMICAL AGE*, 29 November, p. 893, are of great economic importance. The work in every instance necessitates close and intimate contact with local authorities all over the country and with various mining interests (coal and mineral). This could not possibly be carried out by workers with University grants.

It should be mentioned here that the National Coal Board is interested in the use of thiobacilli in making vast stocks of useless coal suitable for coking purposes which is in short supply. The N.C.B. very recently announced

that they had the money available and wanted the microbiology unit to go ahead with the work.

It must be stressed that the knowledge of economic microbiology possessed collectively by the group extends far beyond the immediate topics of research. Advisory services to industry, individual workers and public bodies have formed an important part of the research section's activities. It is the only centre of information on general economic microbiology in Britain. University departments could not reasonably be expected to maintain such a service and would not in any case possess the wide accumulated knowledge of the present group.

It is learned that at one time the whole of the strategic air reserves in the Middle East was grounded due to the production of  $H_2S$  by sulphate-reducing bacteria in the water-bottoms of storage tanks. The microbiology unit found out the cause and advised that either water bottoms should not be used or, if this was essential, an inhibitor should be used to prevent bacteria growth. Oil companies have reduced incidents of this nature and have good cause therefore to be grateful to the unit. All this kind of work is obviously more appropriate to D.S.I.R. than to either industry or a University.

The economic value of the unit's research on bacterial treatment of sewage was noted in *CHEMICAL AGE* of 29 November. At the time of the 1950 sulphur shortage, the unit started to investigate microbial production of sulphur. The process is now at pilot plant stage and the London County Council is preparing to test it in semi-scale trials. While 10 oz. of sulphur can be obtained from 50 tons of sludge using 5 lb. of calcium sulphate, the L.C.C.'s interest at present is centred on the production of methane which can be used as the source of power at the sewage works and on cutting down the water content of the final sewage sludge. It is this work and the knowledge which the microbiology unit has acquired which is so valuable and can be of even greater value in the years to come.

It is significant that the people concerned at the unit—some 13—have not complained about the cavalier treatment handed out to them. Their sole concern has been or their work as a whole. Even if D.S.I.R. cannot appreciate the importance of the work and the advice of the microbiology unit, the U.S. does. One of the senior members of the group has this week already received a telephone call from a U.S. University inviting him to continue his research there!

If the D.S.I.R. Research Council is too short-sighted to reconsider its singularly inept decision, then perhaps the Minister responsible will pay heed to the representations that are being made to him.

## ***Lord President Asked to Intervene in D.S.I.R. Controversy***

# **Decision to Disband N.C.L. Microbiology Unit Arouses Strong Opposition**

**F**OLLOWING the decision on 11 December by the Research Council of the Department of Scientific and Industrial Research to disperse the National Chemical Laboratory's Microbiological group, the unit has now taken the matter up with the Institute of Biology and the Institution of Professional Civil Servants (I.P.C.S.).

Below are the statements issued by D.S.I.R.'s Research Council and the combined statement of the Institute of Biology and the I.P.C.S.. The I.P.C.S. has asked the Lord President of the Council to receive a deputation to urge upon him that he:

(a) invites and considers the detailed views and recommendations of the disbanded Advisory Committee before any action is taken to break up the Microbiology group;

(b) takes note of the fact that there is no other group in the country concerned primarily with exploratory economic microbiology;

(c) takes into account the possible economic value attaching to the fields of research such as the following: physiology of the sulphate-reducing bacteria, laboratory work in association with the pilot plant trials on the microbial production of sulphide undertaken by London County Council at Beckton, investigation of the methane bacteria, studies on the sulphur-oxidising bacteria, maintenance of the National Collection of Bacteria, and advisory services;

(d) bears in mind that the building up of an efficient research team has taken very many years and that its destruction is especially to be regretted at a time when the utmost value needs to be secured from the nation's slender scientific resources;

(e) explores fully the possibility of establishing microbiology as a clear and self-contained entity within D.S.I.R. or, failing that, of its attachment to another appropriate establishment to avoid the break up of the present group.

### **D.S.I.R. Statement**

After considering certain aspects of the organisation and support of industrial microbiological research which is undertaken by the Department of Scientific and Industrial Research at the Water Pollution Research Laboratory, the National Chemical Laboratory, the Low Temperature Research Station, the Dilton Laboratory and the Torry Research Station, the Council for Scientific and Industrial Research, on 11 December decided to disperse gradually the microbiology group at the N.C.L. Teddington. This group is the only one in the U.K. devoted to research on bacteria of industrial interest (see *CHEMICAL AGE*, 29 November, p. 893).

The work on microbiology at the N.C.L. has been divided into four main parts, viz.: (i) The National Collection of Industrial Bacteria; (ii) Study of metal corrosion; (iii) Investigation of sulphur

bacteria; (iv) Investigation of methane-producing bacteria.

With the dispersal of the microbiology group the future of the work, it has been decided, would be as follows:

D.S.I.R. will continue to maintain the National Collection of Industrial Bacteria. This, it is considered, will be best done at the Torry Research Station where there is already a comparable collection of marine bacteria; (ii) the microbiological research concerned with metal corrosion will be retained at the National Chemical Laboratory and strengthened; (iii) the fundamental investigation of sulphur bacteria will be brought to a conclusion at N.C.L., though allied work may be supported at a university, if this is considered to be justified; and (iv) fundamental work on microbial formation of methane can very appropriately be carried out in a university.

Applied research in the fields covered by (iii) and (iv) is within the field of activity of the Water Pollution Research Laboratory, where any further work will be carried out if this is considered to be necessary. D.S.I.R. will continue, if desired, to advise the London County Council on the pilot-scale trials which they are making for the treatment of sewage involving the production of hydrogen sulphide by sulphate-reducing bacteria.

The Council in their statement say that they believe that an industrial microbiology team is able to do the best and most effective work when it operates

within a research laboratory concerned with the technology served by the team. This and a firm practical objective are to be found in the Water Pollution Research Laboratory and the food research laboratories, they state.

Also, although the microbiology group at N.C.L., which numbers less than 20, has done good work, the Council consider that the unit is inappropriately placed there, and apart from those working on the corrosion of metals, the chemical groups do not benefit from the microbiological work. The present research work of the unit would, in general, the Council state, be most effectively carried out in university departments. They therefore propose to encourage the expansion of such work by making grants to universities for promising investigations.

Regarding the alleged omission to consult the microbiology committee appointed in 1952 to advise on a wider programme of research by the Teddington group, D.S.I.R. state that the views of the committee were made fully known to the (former) Chemistry Research Board, the secretary of D.S.I.R., and a review committee of the Research Council, and through them to the steering committee of the N.C.L. and to the council.

The council's intention is re-affirmed to build up a strong microbiology group at the Water Pollution Research Laboratory in order that a study of the processes which occur in the treatment of sewage, industrial effluents, and the purification of rivers may lead to a better understanding and control of practical methods of treatment and to the development of new or improved methods.

The staff of the microbiology group will be transferred with the National Collection, to the Water Pollution Research Laboratory or remain at the N.C.L. as may be appropriate.

## **'Decision Made Without Consulting Head of Unit or Microbiology Advisory Committee'**

**L**AST May the report of the (then) Chemical Research Laboratory Review Committee of the Research Council stated '(xvii) The microbiological research should be transferred to an existing microbiological research laboratory, or set up as a research unit attached to a university, and the practicability of such a change shall be examined' and that '(x) The present Committee of the Chemistry Research Board on microbiology shall be continued as a Sub-committee of the new Steering Committee until the future of

microbiology has been decided.'

In their statement the Institute of Biology and the Institution of Professional Civil Servants (I.P.C.S.) say that 'none of the staff of the Microbiology Group was informed of the possible developments until on 28 November the director of the National Chemical Laboratory announced that the Steering Committee of N.C.L. had made the following recommendations to the Research Council of D.S.I.R. (a) the National Collection of Industrial Bacteria should be moved to the Torry Re-



search Station; (b) the research section of N.C.L. Microbiology Group should be disbanded; (c) universities should be informed that the department is prepared to consider applications for awards of special research grants to support research on microbiological research projects, likely in the short or long term to lead to useful industrial applications; (d) when the progress of research carried out elsewhere calls for pilot-scale facilities, the Ministry of Supply should be asked to undertake industrial microbiological research and development using the facilities at the Microbiological Research Establishment, Porton

The staff were told at the same time that the microbiology sub-committee was to be disbanded at once, i.e. before the Research Council had considered the recommendations of the Steering Committee.

The decision was made without any consultation with the head of the Microbiology Group and without consultation with the Advisory Committee on Microbiology.

Need for Government Research. The Microbiology Group of the N.C.L. meets an essential need of British industry, its functions cannot satisfactorily be discharged by any other body, and the decision of the Research Council of D.S.I.R. to disband the group is ill-advised and if implemented will damage the national economy. A broad field of economic microbiology exists on which research is entirely appropriate to D.S.I.R. and cannot reasonably be covered by industry or the universities. The decision to establish special research grants at universities will not meet the need for such work.

### Industrial Bacteria

National Collection of Industrial Bacteria. 'It is very strongly held that the National Collection of Industrial Bacteria should not be separated from the research unit. The unit has maintained 'difficult' organisms for the collection and has assisted in solving *ad hoc* and advisory problems. Correspondingly, the National Collection of Industrial Bacteria (N.C.I.B.) has helped the research unit technically as well as by supplying cultures.

A collection of industrial bacteria should be in the hands of those who understand the uses to which they will be put. This involves periodic checking not only of their purity but of their behaviour, this work cannot be carried out by routine workers. Only a group actively engaged on problems of industrial microbiology is capable of maintaining, adequately, such a collection.

The recommendation to transfer the N.C.I.B. to Aberdeen, unaccompanied by the research unit, is ill-advised for the following reasons: (a) The majority of requests in Britain come from the south. A visit to the collection is often necessary to decide on an appropriate culture and to obtain information on using it. Such visits would be highly inconvenient and sometimes impossible were the collection at Aberdeen; (b) a laboratory with a section specialising in marine microbiology even though it

maintains its own modest collection of marine bacteria, is not an appropriate home for a world famous collection of organisms of industrial, economic and research importance; (c) the present curator of the collection is secretary of the permanent committee of the British Commonwealth Collections of Micro-organisms and should be reasonably accessible to Commonwealth visitors and inquirers.

Need for an Independent Executive Committee. Research on microbiology at the N.C.L. has received, it is stated by the Institute of Biology and the I.P.C.S., 'less than its fair share of attention; its claims have been assessed

against the competing claims of chemical research and not, as should have been the case, in relation to the responsibilities of the department as a whole. . . . The decision of the Research Council illustrates this in an extreme form and emphasises the need for an independent executive committee of microbiologists not only to guide the group's research, as it has, but to give informed advice to the Research Council. Neither the Steering Committee of the N.C.L. nor the D.S.I.R. Research Council itself contains a microbiologist. It is astounding that a decision to close down the unit should have been taken without appropriate advice.'

## World Polyolefin Plants Listed

THE following table shows the world capacity for polyolefin plant, estimated in million lb. annually. It appeared in *Chem. and Engng. News*, 1958, 36, No. 49, 20. The following are the symbols used in the third column: C, conventional; P, Phillips; Z, Zeigler; P.P., polypropylene; L.P., low-pressure.

Producer	Size	Type	Producer	Size	Type
<b>United States</b>					
Union Carbide			<b>United Kingdom</b>		
S. Charleston, W. Va. ...	70	C	I.C.I. ...	200*	C
Texas City, Tex. ...	65	C	British Hydrocarbon Chemicals ...	24*	P
Seadrift, Tex. ...	60	C	Union Carbide	20	C
Torrance, Calif. ...	60	C	Monsanto	20*	C
Whiting, Ind. ...	72*	C	Shell ...	2	Z
Institute, W. Va. ...	30	P			
Seadrift, Tex. ...	25	P	<b>Australia</b>		
Du Pont, Orange, Tex. ...	200	C	I.C.I. ...	7	C
<b>National Petro-Chemicals</b>					
Tuscola, Ill. ...	100	C	<b>India</b>		
Houston, Tex. ...	75*	C	Alkali & Chemical	12	C
Eastman, Longview, Tex. ...	85*	C	National Carbon ...	6*	C
Phillips, Pasadena, Tex. ...	75	P	I.C.I. ...	Planned	C
Monsanto, Texas City, Tex. ...	90*	C			
Spencer, Orange, Tex. ...	90*	C	<b>Japan</b>		
Koppers			Sumitomo ...	22	C
Port Arthur, Tex. ...	25	C	Mitsubishi-Yoka	30*	C
Port Reading, N.J. ...	30	Z	Mitsui	20*	Z
Dow, Freeport, Tex. ...	52†	C	Showadenko	20*	P
Bay City, Mich. ...	—	P	Fakukura	14*	Std. (Md.)
Celanese, Pasadena, Tex. ...	40	P			
Grace, W. R., Baton Rouge, La. ...	50	P	Nissan Chemical Ltd. ...	10*	PP
Hercules Powder					
Parlin, N.J. ...	30	Z			
Parlin, N.J. ...	20	PP			
Humble, Baytown, Tex. ...	40*	PP			
<b>Canada</b>					
Canadian Industries, Edmonton ...	40*	C			
Union Carbide, Montreal ...	40*	C			
Du Pont, Sarnia, Ont. ...	25*	LP			
Dow, Sarnia, Ont. ...	5-10*	Z			
<b>Brazil</b>					
Union Carbide ...	8-10	C			
Industria Chimica ...	8-10*	P			
Electro Chloro ...	10*	Z			
<b>Mexico</b>					
Petroleus Mexicanos ...	14*	P			
<b>Germany</b>					
Rheinische Olefin Werke ...	75	C			
(BASF-Shell) ...	13*	P			
Hoechst ...	44	Z			
	17	PP			
Hibernia-Hüls ...	17	Z			
Ruhrchemie-Rhein pressen ...	11*	Z			
B.A.S.F. ...	11	C			
<b>Italy</b>					
Montecatini ...	44*	PP			
	44	C			
Celene (Edison-U.C.C.) ...	24*	C			
Solvay ...	15*	P			
Asfalti Bitumi Combustibili Liquidi	22*	C			
<b>France</b>					
Soc. Ethylene Plastique ...	22	C			
Soc. Ethylene Plastique Normandie	24*	C			
Manufacture Normandie de Polyethylene ...	13*	P			
Soc. Normandie de Matiers Plastiques ...	11*	Z			
Naphtachimie ...	9	Z			
<b>Netherlands</b>					
Dutch State Mines ...	13*	C			
<b>Austria</b>					
Danubia Petrochemie Montecatini	11*	PP			
Stückstoffwerke ...	—	—			
<b>Spain</b>					
Union Quimica ...	13*	C			
<b>Belgium</b>					
Petrochim-Union Carbide ...	Planned	C			

Chemical Age wishes  
a Happy Christmas  
to all its Readers

### Draft B.S. for Cold-Water Polythene Tube

POLYTHENE (type 710) tube for cold water services is the subject of draft British Standard CZ.665 now being circularised for comment by industry. Other draft standards are: CZ.929 pressure regulators for use with butane/propane gases; CZ.1244 flameproof industrial clothing; CZ.1391, rigid p.v.c. extrusion and moulding compounds; CZ.1598 vulcanised butyl rubber compounds; CZ.656 methods of the analysis and testing of coke; CZ.377 code of practice on flameproof and intrinsically safe electrical equipment.

Copies of these drafts can be obtained from British Standards Institution, 2 Park Street, London W.1, free to members, or 2s. to non-members.



# EQUATION SUGGESTED FOR MIXING POWDERED MATERIALS

## 'Little is Known About Mechanical Mixing'

IN spite of the importance of the process of mixing together two or more materials in powder form, according to Dr. H. E. Rose, whose paper was read at a meeting of the Institution of Chemical Engineers held recently, very little appears to be known about the mechanism of mixing or about the characteristics of the various types of machines used.

In general, it appeared to Dr. Rose that the phenomenon of mixing had been studied by analogy with diffusion and equations of the type

$M = 1 - e^{-kt}$  ..... (1)  
had been obtained where  $M$  = perfection of mixing,  $t$  = time of mixing and  $k$  was a constant dependent on the physical characteristics of the powders and the geometry of the mixing machine.

Derivation of an extended form of the equation was described by Dr. Rose and showed that, although it was empirical, it fitted the experimental results of many workers with reasonable accuracy over a much wider range than did an expression of the type of equation (1).

An equation for mixing should, ideally, make use of parameters that are directly calculable from the physical properties of the elements of the system, e.g., shape, size and density of the particles of the two components and the dimensions of the mixer.

With this object in view an analysis was made, on the basis of published results, of the relation between the parameters of the proposed equation and a number of the physical properties of the system. This was a new approach which suggested that many of the relationships were simple and further research might lead to expressions from which the performance of a mixing system could be calculated.

The equations arrived at were

$$M = \eta \left\{ 1 - [(1 - B/A)e^{-A^{1/2}} + B/A]^2 \right\}$$

or

$$M = \eta \left\{ 1 - [B/A - (1 + B/A)e^{-A^{1/2}}]^2 \right\}$$

An incidental analysis into the relationships between the parameters of the equation and the physical dimensions of the system was carried out. Parameter  $A$ , which has the dimension  $\text{time}^{-1}$ , was expected to depend on the diameter and speed of rotation of the mixer,  $D$  and  $N$  respectively, on the mean diameter,  $d_m$ , on the mean value of the coefficient of friction,  $f_m$ , of the particles composing the mixture and on the acceleration due to gravity,  $g$ .

On applying the principle of dimensional analysis to these variables, it was found that

$A \propto N \times \psi_1(D/d_m) \times \psi_2(N/N_c) \times \psi_3(f_m)$   
where  $\psi$  denoted 'some function of the following variables'.

Similarly,  $B$  was expected to depend on  $D$  and  $N$ , on the mean diameter,  $d_m$ , of the particles composing the mixture, on the difference  $\Delta d$ , of the mean sizes of the two components of the mix, on the mean density,  $\rho_m$ , of the mixture and on  $\Delta\rho$ , the difference of the densities of the two components of the mix.

Dimensional analysis led to  
 $B \propto N \times \psi_4(D/d_m) \times \psi_5(N/N_c)$

$$\times \psi_6\left(\frac{\Delta\rho}{\rho_m}\right) \times \psi_7\left(\frac{\Delta d}{d_m}\right)$$

Later in the paper an analysis of the functional relationships involved in these two equations was presented.

**Analysis of experimental data:** To verify the validity of the equation, corresponding curves were fitted to the experimental data of a number of workers. Excellence of fit, together with the consistency in the values of the parameters between the different tests, were taken as an indication of the validity of the treatment.

**Influence of speed of rotation:** From the results it was shown that parameters  $A$  and  $B$  increased with increasing speed of rotation and the curves defined by the experimental points were identical in form. Thus rate of mixing and 'demixing' both increased with increasing speed of rotation but the value of  $B/A$  was independent of speed of rotation.

### Maximum Mixing Degree

It thus appeared that the maximum possible degree of mixing,  $\eta$ , and the equilibrium mixing  $M_e$  which could be attained in a given machine were very nearly independent of speed of rotation.

Using other formulae, the points coincided very well with the curve and so it seemed that the rate of mixing was proportional to the power absorbed per unit mass of mixer charge. Since  $B/A$  was sensibly constant, it followed that  $B$  depended on the speed in the same way as  $A$ , not a surprising result when the mixer is also regarded as a 'demixer'. There is thus no reason why one process should be favoured.

**Influence of particle size:** The variable next considered was the ratio of the diameter of the particles in the two components and it was concluded that the intrinsic efficiency of the machine did not vary greatly with the size ratio. This was as expected since intrinsic efficiency is a function of the geometry of the machine.

The influence of the angle of elevation of the axis of the mixer was not studied, and no other published work was available for comparison.

Attention was then directed to the

phenomena which seemed to arise from the slipping of the charge of the mixer relative to the mixer shell. It had already been observed by Weidenbaum and Bonilla, working with a cylindrical mixer rotating about a horizontal axis, that mixing reached a maximum, decreased, increased to another maximum and then decreased until an equilibrium value was reached.

To study this phenomenon further, the author, with Mr. P. R. Powis, studied mixing in a Perspex cylindrical mixer, in which the axis of the cylinder was arranged at 25° to the (horizontal) axis of rotation, driven through a dynamometer. After a direct test, the mixer was lined with thin brass and the brass was polished with coarse emery cloth so that it had a matt surface which was rough compared with Perspex but which was not rough enough to offer significant mechanical interlocking.

The results from these tests suggested that although radial mixing was not significantly altered, rate of axial mixing increased by about 50%. The power demand was increased by about 80%.

From this it was concluded that the rate of mixing could be expected to vary as the root of the linear dimensions of the machine.

**Mixing using conical hoppers:** There was evidence that the equations were valid for tests using conical hoppers, but for angles less than about 28° there was no mixing because, with smaller angles, the demixing arising from differences in the components was greater than the mixing in the cone.

### Symbols Used

- $A$  = coefficient defining rate of mixing.
- $B$  = coefficient defining rate of 'demixing'.
- $d_m$  = arithmetic mean of the mean diameters of two components.
- $\Delta d$  = difference between mean diameters of the two components.
- $D$  = diameter, or other characteristic linear dimension, of mixer.
- $e$  = base of natural logarithms.
- $f_m$  = mean value of coefficients of static friction of material of the mix.
- $g$  = acceleration due to gravity.
- $M$  = degree of mixing.
- $N$  = speed of rotation of mixer.
- $N_c$  = critical speed of rotation of a drum-type mixer.
- $t$  = time.
- $\rho_m$  = mean density of charge.
- $\Delta\rho$  = difference between densities of the two components.
- $\psi$  = 'a function of'.

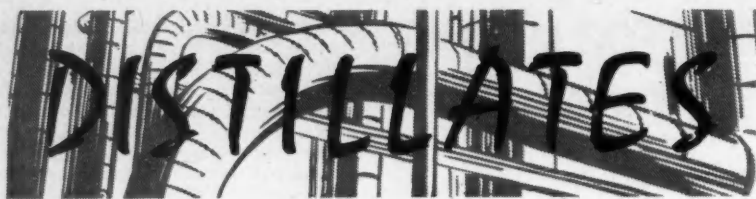
### I.C.I.'s Safety Film

In their latest safety film, 'The Human Factor', I.C.I. say they are working towards an accident frequency rate of 0.25 for every 100,000 hours work (the normal working life of the individual). This year I.C.I.'s accident rate is down to 0.44, although in 1946 it was just under 3.

### Obituary

MR. WILLIAM P. RYCE, sales representative of Orobis Ltd. since 1954, died on 12 December, after a short illness.

MR. THOMAS A. WILSON, for some years manager of the Glasgow Corporation chemical works department and a well-known figure in the Glasgow trade,



★ Two of the big West German chemical companies, B.A.S.F. and Chemische Werke Hüls, report that turn-overs for 1958 will again be a record. B.A.S.F. say that the 1958 dividend will be higher than last year's 11%. They add that the turnover increase over 1957 will be quantitative, rather than one of value owing to many price reductions made in recent months.

Chemische Werke Hüls state that their turnover for 1958 will be up by 9.6%, the same increase that was experienced in 1957 over 1956. Actual turnover in 1957 was valued at DM 523 million (about £43½ million). Exports in 1958 have remained about the same as in 1957 when they represented about 35% of total turnover.

Up to the end of October, investments totalled DM 64.1 million (about 5¼ million), slightly below the total for the whole of 1957. The company says that research has been carried out on plastics, textile auxiliaries, detergent bases, etc., with 'marked success'.

★ AN INTERESTING application of the Parco-Lubrite process has been made at the Harwell Atomic Energy Research Establishment where the remote handling group were experiencing an unusual corrosion problem. This arose over the handling of radioactive specimens, where it was necessary to carry out the work in closed boxes.

In one cell, where large quantities of water, acetone, carbon tetrachloride and paraffin were used, these solutions were stored in open vessels, where evaporation could take place. In addition, the nitrogen atmosphere fed from bottles tended to be damp. As a result the adaptor of the remote-handling tong became corroded onto the tong head. This problem was solved by treating with the Pyrene Company's Parco-Lubrite process, followed with a molybdenum disulphide finishing treatment.

★ IN VIEW of the fact that so many chemical companies in this country are extremely reluctant to divulge any information concerning explosions or other damage to their plants, I was pleasantly surprised when Hickson and Welch showed a more imaginative approach to my inquiries concerning an explosion on Saturday last at their Castleford Works.

Causing local damage, mostly to the company's own housing estate at the site of the works in the form of broken windows, it occurred in the mononitrotoluene distillation unit. This comprises a large base vessel of 10,000 gall.

capacity with an 80 ft. high column. Distillation had been completed and nitrogen was being introduced to bring back the pressure to atmospheric. It was at this stage that the mononitrotoluene ignited. The safety valve of the vessel blew, but did not relieve the pressure. Under certain circumstances mononitrotoluene can maintain combustion even in the presence of nitrogen.

The present incident will be thoroughly investigated to obtain more information. Fortunately because of the heavy demand on mononitrotoluene which is used at the works to produce paranitrotoluene (used in the Photine range of optical whitening agents), the company have doubled-up on production capacity. The second unit is undamaged and is in operation. Deliveries will not be affected and in any event large stocks are available.

★ THE announcement last week that Sir John Benn, Bt., a director of Benn Brothers Ltd., proprietors of 'CHEMICAL' AGE, has been appointed chairman of the Robert Fleming Trust Management Ltd., sponsors of the new Crosby Unit Trust, is another notable development of his activities in the City. Sir John joined his family publishing firm on coming down from Cambridge in 1926. He was concerned with the trade and technical journals published by Benn Brothers until the outbreak of war. After service with the King's Own Yorkshire Light Infantry and on the staff, he returned to publishing as chairman of Ernest Benn Ltd. in 1945, and soon revived that company's war-neglected books.

Later he joined the board of the United Kingdom Provident Institution, and became chairman in succession to his father, the late Sir Ernest Benn, in 1949. While continuing as a director of Benn Brothers and of Ernest Benn, Sir John has devoted most of his time to the City in recent years. His knowledge and experience of good public relations, acquired in Fleet Street, has been of the greatest value to the advocates of private enterprise in insurance and banking circles.

★ A BETTER way of making lagging mattresses for certain applications earned £350 for Mr. Arthur Ellis, one of a full-time squad engaged on servicing the miles of pipes and hundreds of vessels at I.C.I.'s Wilton Works. Mr. Ellis found that by using a wire-netting 'box' filled with insulating material it was necessary to cover only one side of the mattress with asbestos or glasscloth.

The process not only means saving time and materials, it also produces a more uniform mattress.

Mr. T. Hewitson won £120 in the I.C.I. suggestion scheme, for an idea that sprang from his experience of breaking away flange lagging on pipes and vessels so that maintenance work could be done. The renewal was a lengthy job; first magnesia slabs had to be fitted over the flange, followed with wire-netting and a hard-setting compound. Mr. Hewitson found a way of making pre-formed flange covers in the workshop which could be clipped on to the flange with a band. Now only the band is cut, the cover remaining intact to be replaced after maintenance work is done.

★ CYANAMID INTERNATIONAL have introduced a new textile-processing agent which inhibits the development of odour-causing bacteria in fabrics. The chemical, known as Aerotex purifying agent No. 1, is most effective on cellulosic fabrics—cotton, rayon, etc.—but it has also been shown to have good durability in fabrics made from a blend of cellulosic and man-made fibres. Laboratory and field tests carried out by the company demonstrate that the product retains its effectiveness after many washings or dry cleanings.

Unlike other anti-odour agents, such as chlorophyll, Aerotex does not work on the principle of suppressing or neutralising offensive smells, but resists the build-up of the initiating bacteria and thus prevents the development of socially unacceptable odours. Cyanamid foresees a considerable future for this chemical in the treatment of fabrics used in the manufacture of undergarments and nightware. It was developed at the Cyanamid textile chemicals laboratory, near New York City.

★ ACCORDING to some sections of the popular Press, British Railways as a profit-making enterprise are 'washed-up' and some critics go so far as to call for the utilisation of existing railroads as express motorways. It seems that B.R.'s present troubles stem not from passenger traffic, which improves as modernisation progresses, but from a drastic falling off in freight, particularly for coal and steel.

There is no doubt that the chemical industry has also been turning increasingly to road transport for the carriage of both liquids and solids. Mr. W. J. V. Ward, chairman of I.C.I. Billingham Division, recently stated that nearly 1 million tons of goods each year are now despatched by road. Formerly most of the division's materials were sent by rail. B.R. should be able to woo back much chemical and other traffic once modernisation has speeded the service and improved efficiency. A combination of road and fast-rail freight might then be more practical than it now is.

*Alembic*

# POLAROGRAPHERS MEET IN W. GERMANY

## Recent Developments and Applications in U.K. Described by W. J. Parker

ONE hundred and eighty polarographers and members of the Polarographic Society attended a three-day International Colloquium on Polarography held in the University of Bonn recently. The meeting, which was organised by Professor M. von Stackelberg, a member of the Society, consisted of six sessions for the presentation and discussion of 40 papers on polarography, together with an exhibition of British and Foreign Polarographic Instrumentation. Members were welcomed by Professor Stackelberg at a reception held in the Student's Union. A colloquium dinner was also arranged in the student's hall of the university. The business sessions were held in the Physical Chemistry Institute of the University.

The programme for the six sessions consisted of 12 papers on methodology and apparatus, 12 papers on analytical applications, nine papers on theory and kinetics and seven papers on biochemical and physiological investigations.

It was the impetus given by Professor J. Heyrovsky's discoveries at University College, which led to an early and extensive development of polarographic instrumentation in Great Britain, resulting in the commercial production of recording polarographs by the Cambridge Instrument Co. and by Tinsley (Industrial Instruments) Ltd. in 1939. This was stated by W. J. Parker (secretary, British Polarographic Research Institute) in his paper dealing with the introduction and early development of polarography in Great Britain.

Development of instruments with new facilities providing for greater resolution or sensitivity or both, had proceeded at an ever increasing pace culminating in the production today by five different companies in Great Britain of a range of no less than 10 different types of polarograph, many of which are quite unique, extending from the manual polarograph of Electrochemical Laboratories, to the Univector unit of the Cambridge Instrument Co., the cathode-ray polarograph of Southern Instruments, and the Mervyn Instruments' production of the Barker square-wave polarograph.

### Electrode Development

Polarographic electrode development has also been vigorously pursued leading to the production of the wide-bore electrode by Knowles and co-workers and to the twin electrode technique by Barker and Faircloth.

In industrial polarographic instrumentation, both Cambridge Instrument Co. and Tinsley (Industrial Instruments) Ltd. had developed equipment for continuously recording the dissolved oxygen-concentration in boiler feed water while Knowles and co-workers at the Water Pollution Research Laboratory had successfully applied the wide-bore electrode to the continuous recording of dissolved oxygen in sewage, effluents and river waters.

Currently, polarographic research and development in Great Britain was leading to the production of new instruments, with enhanced performance, at a rate unapproached in any other country,

stated Mr. Parker. Southern Instruments had now produced an anodic attachment enabling the cathode-ray polarograph to function at anodic potentials; Dr. G. C. Barker at the U.K.A.E.A., Harwell, had developed the pulse polarograph and the radio-

frequency polarograph, both instruments having a sensitivity and resolving power exceeding that of any other polarograph in the world.

Considerable effort was being devoted in Great Britain toward the development of new applications for the vast range of instruments now in production. The versatility of these instruments in metallurgical analysis was demonstrated by slides showing a wide range of polarograms prepared by C. A. Wontner, Electro Chemical Laboratories; Dr. G. Jessop, Cambridge Instrument Co. Ltd.; Mrs. B. Lamb, Tinsley (Industrial Instruments) Ltd. and J. Hetman, Southern Instruments. Other slides demonstrated their wide applicability to gas analysis, such as the determination of atmospheric pollutants by the Mervyn-Harwell square-wave polarograph.

The production of purer polarographic reagents was being energetically pursued, and a world-wide survey of the quantity and quality required of such reagents was being conducted by a representative committee formed at the instigation of the Polarographic Society.

## Oscillographic Polarography by G. F. Reynolds

Development of oscillographic polarography was traced from the first studies made in 1938 by Muller *et al.*<sup>1</sup> and by Matheson and Nicholls<sup>2</sup>, by Mr. G. F. Reynolds (Chemical Inspectorate, Ministry of Supply) in his paper on this subject.

The former employed a superimposed alternating voltage on the normal direct potential difference applied to the electrodes, while the latter used a linear voltage sweep instead of the usual slowly changing potential. It was stated that the superimposed A.C. method had not found wide use except in the important studies of Heyrovsky and his co-workers. Most of the work on oscillographic polarography had employed the linear sweep principle.

The linear sweep technique was subdivided into the multi-sweep and single-sweep methods. The former had been extensively studied by Delahay in America<sup>3,4</sup>. The latter had been devised by Randles<sup>5,6</sup> and extended by Davies and Reynolds<sup>7</sup> in England. The

difference in the technique was in the application of the voltage sweep. In the multi-sweep method this took place several, or many, times during the lifetime of each mercury drop, but it was applied once per drop only in the single-sweep method. It had been shown that the rapidity of application of the sweep caused serious defects in the multi-sweep method and only single-sweep working was now used.

The instrument of Davies and Reynolds was discussed and it was noted that this instrument was now commercially available from Southern Instruments Ltd., Camberley. Advantages of the method over conventional polarography, especially in regard to sensitivity and speed of operation were discussed.

### REFERENCES

1. *Ind. Eng. Chem. Anal. Ed.*, 1938, 10, 339.
2. *Trans. Electrochem. Soc.*, 1938, 73, 193.
3. 4. *J. Phys. Chem.*, 1949, 53, 1279; *Anal. Chim. Acta*, 1951, 5, 129.
5. 6. *Trans. Faraday Soc.*, 1948, 44, 327; *Analyst*, 1947, 72, 301.
7. *Analyst*, 1953, 78, 314; *Electronic Eng.*, 1953, 25, 314.

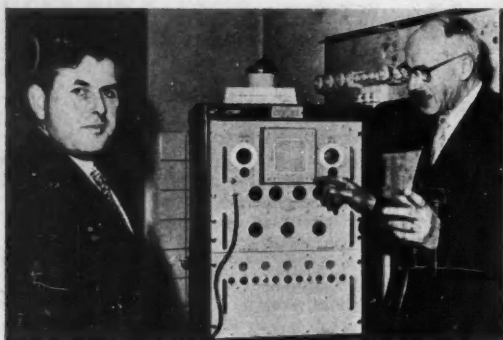
## Polarography of Aluminium

DIRECT polarography of aluminium was discussed by Mr. G. F. Reynolds (Chemical Inspectorate, Ministry of Supply). It was shown that the step for this element was always preceded by the hydrogen reduction, which limited the pH that could be employed. In addition if the pH of the solution were too high the aluminium was precipitated as hydroxide. The usable pH range be-

tween these two conditions was too narrow and critical to be useful for analytical purposes.

Study had been concentrated on the method using azo dye Solochrome Violet R.S., first suggested by Willard and Dean<sup>1</sup>. This method made use of the fact that the dye was reduced at the dropping mercury electrode to give a single wave in the absence of an aluminium wave,





G. F. Reynolds, chairman, Polarographic Society (left) and Professor M. von Stackelberg, head of the physical chemistry Institute, Bonn University, discuss the Southern Instruments cathode ray polarograph

but when aluminium was present this wave became two separate steps about 0.2 volts apart. The height of the second wave was proportional to aluminium concentration.

This very sensitive method for the determination of aluminium had been used to develop methods for trace amounts of aluminium in materials such as beryllium, and the interferences by other ion species had been thoroughly investigated.

The effect of pH on the aluminium-dye wave had been studied and this had yielded the information that two complexes existed, one stable in the range pH 4.2-5.0 (the complex reported by Willard and Dean) and the other in the range pH 5.75-7.0 (not hitherto reported). A large number of physico-chemical measurements were made and among the information obtained were the facts that the reduction of the dye, the dye-aluminium complex at pH 4.6 and the complex at 6.5 involved 2, 4 and 6 electrons res-

pectively. The combining ratios were found to be 2 dye:1 aluminium and 3 dye:1 aluminium respectively.

By studying a number of similar azo dye and by analogy with the results of other workers it was concluded that there were true Werner complexes in which the configuration of the benzene rings about the azo group in each dye molecule was *trans* but that the *ortho* OH groups were as nearly *cis* and *coplanar* as steric effects would permit.

Combination with the aluminium atom by the two dye molecules at pH 4.6 took place at the two *ortho* OH groups and at the azo group in resonance. This gave a fused ring structure of high stability. This structure was impossible for the complex at pH 6.5 since it would require an aluminium coordination number of 9. The nature of the bonding at this pH had not yet been elucidated.

#### REFERENCES

1. Welland and Dean, *Anal. Chem.*, 1950, 22, 1264.

### Dr. G. C. Barker on Pulse Polarography

AN a.c. polarographic technique was described by Dr. G. C. Barker (U.K.A.E.A., Harwell) which gave an improved normal polarogram as well as derivative polarograms. To obtain a normal polarogram the cell voltage was held for most of the time at a fixed value but, at a predetermined time in the life of each drop, it was changed by a polarising pulse for 1/25 sec. to a value that gradually became more negative.

Electronic circuits measured the change in diffusion current produced by each pulse during the second half of the pulse life. The same circuits were used to obtain a derivative polarogram, but in this case small pulses of constant amplitude were used and these pulses were superimposed on a slowly changing voltage.

When a normal polarogram was recorded, reversibly and irreversibly reduced ions could be detected at concentrations down to  $10^{-7}$ M. and, as the polarogram was automatically compensated for any diffusion current flowing before the occurrence of a pulse, a minor constituent could be detected in the presence of a major constituent that was reduced at a more positive potential. With the derivative circuit reversibly reduced ions could be detected at concentrations down to  $10^{-9}$ M.

### Polarography in Molten Salts

POLAROGRAPHIC investigations of solutions of metal chlorides in alkali chloride melts have been made by G. J. Hills and J. E. Oxley (Imperial College, London) using gas-flushed and stationary micro-electrodes flexibly mounted in a vacuum-tight glass or silica envelope. Reproducible conditions of convection and diffusion enabled quantitative polarographic analyses to be made. The use of a cathode-ray polarograph with a stationary electrode was also described.

Hills and Oxley reported that the range of polarography in a molten salt was limited by thermodynamic considerations, the most important of which was the solubility of the base electrolyte (alkali) metal in the solvent melt. This led to a systematic variation of the decomposition potential of the solvent melt, to reactions of the type  $M + xNaCl \rightleftharpoons MCl_x + xNa$  and to a significant contribution to the cathodic current from the alkali metal ion deposition reaction.

#### Rectifiers for Nangal Plant

English Electric steel tank rectifiers will be used, at 765 volts, for the electrolytic production of hydrogen and heavy water in the fertiliser factory of Nangal Fertilisers and Chemicals (Private) Ltd., New Delhi.

### Polarography of the Amidines Studied

POLAROGRAPHIC properties of some aliphatic, arylaliphatic, phenoxylaliphatic and aromatic amidines have been investigated by Dr. P. O. Kane (May and Baker Ltd.) Dr. Kane reported that aliphatic and arylaliphatic amidines were not reducible in the range to -1.8 volts versus the saturated calomel electrode. Phenoxylacetamidines were reduced to the phenol and acetamidine and aromatic amidines were reduced to the benzylamine and ammonium.

The half-wave potentials of both reducible classes of compound were stated to be independent of pH over the range 7-9 pH.

### Full List of Papers Presented at Bonn

The sessions devoted to methodology and apparatus under the chairmanship of Professor H. J. Antweiler, consisted of the presentation and discussion of the following papers:

'Distortion of polarographic derivative curves produced by resistance-capacity networks' by Dr. Th. Jaekel, Deutsche Akademie d. Wissenschaften Institut f. Geratebau, Berlin; 'Oscillographic polarography' by Mr. G. F. Reynolds, Chemical Inspectorate, Ministry of Supply, and chairman of the Polarographic Society; 'Selected period polarography' by Dr. A. W. Elbel, Atlas-Werke A.G., Bremen; 'Experiences with the cathode-ray polarograph' by Dr. M. Hermann, Farbwerke Hoechst, vorm. Meister, Lucius and Bruning, Frankfurt/Main; 'Influence of the potential sweep rate in oscillographic polarography' by Dr. E. Vianello, Universitaet Padua, Institut f. physikal. Chemie.

Under the chairmanship of Mr. G. F. Reynolds, the following papers were presented and discussed: 'Oscillographic determination of reducible and oxidisable substances adsorbed on the electrode surface' by Professor C. A. Knorr and Mr. F. G. Will, Physik.-chem. und elektrochem. Institut d.T.H. Muenchen; 'Some recent developments and applications of Polarography in Great Britain' by Mr. W. J. Parker, Secretary of the British Polarographic Research Institute, Woking, Surrey; 'Pen-recording polarographs,' by Dr. A. Kuntze, Fa. Dr. A. Kuntze, Baelelektronischer Apparate, Duesseldorf; 'A.C. and square-wave polarography,' by Dr. H. Schmidt, Institut f. physik. Chemie d. Universitaet Bonn; 'Pulse polarography,' by Dr. G. C. Barker, U.K.A.E.A., Harwell; 'Construction and manufacture of the Polarecord,' by Mr. E. Greuter, Methrom A.G., Herisau, Schweiz; 'Theory and application of the rotating disc electrode,' by Dr. W. Vielstich, Inst. f. physikal. Chemie d. Universitaet, Bonn.

Sessions devoted to analytical applications were under the chairmanship of Professor V. Gutmann and Dr. F. von Sturm respectively, when the following papers were presented and discussed: 'Polarography in non-aqueous ethylenediamine,' by Mr. G. Schoeber and Professor V. Gutmann, Institut f. allgem. u. anorg. Chemie d. T. H. Wien; 'The theory and practice of polarography in ionic melts,' by Dr. G. J. Hills and Mr. J. E. Oxley, Imperial College, Department of Chemistry, London; 'Limits of application of polarography in inorganic analysis,' by Dr. F. von Sturm, Siemens-Schuckert Werke A.G., Erlangen; 'Applications of polarography in industry,' by Dr. W. Buechler, Ciba A.G., Basel; 'Polarography of aluminium,' by Mr. G. F. Reynolds, Chemical Inspectorate, Ministry of Supply; 'Polarographic behaviour of a heteropoly acid formed from molybdenum and a silicate,' by Professor H. Hahn and Mr. K. Grashoff, Institut f. anorg. Chemie d. Universitaet Kiel; 'Polarographic determination of chromium, titanium and vanadium,' by Dr. G. Hauck, Feldmuehle AG, Luedsdorf; 'A.C. polarography of organic compounds and the influence of the solvent,' by Dr. K. Schwabe and Dr. H. Jehring, Institut f. Elektrochemie u. physikal. Chemie d. T. H. Dresden; 'Separation of analogous compounds or isomers by classical polarography and by oscillographic

(Continued on facing page)

## POLAROGRAPH PIONEERS— EVERSHED & VIGNOLES

IN the sphere of analytical chemistry, the Tinsley polarographs manufactured by Evershed and Vignoles Ltd., Acton Lane Works, Chiswick, London W.4, are widely used. Temperature measurement is covered by optical and radiation pyrometers; a wide range of fractional horse-power motors and servo systems is manufactured; and for measurement of non-magnetic coatings on ferrous bases, there is the Tinsley thickness gauge.

It is from Sydney Evershed's laboratory work on insulation testing in the closing years of the last century (it was in 1805 that with E. B. Vignoles, Sydney Evershed formed the present company) that there has grown up a large organisation with interests in nearly every sphere of industry, from the designing and production of instruments to large process control schemes.

Because of the scope of the business conducted by Evershed and Vignoles, the company has been divided into three main divisions: Instrument Division, Instrumentation and Controls Division, and Naval Division.

### Pioneering Work

Tinsley Industrial Instruments Ltd., a subsidiary of Evershed and Vignoles, are pioneers in the design and development of the polarograph. It was the company's own research into the fundamentals of d.c. polarography that led to the Tinsley polarograph. The company was also responsible for introducing the pen-recording polarograph in 1942.

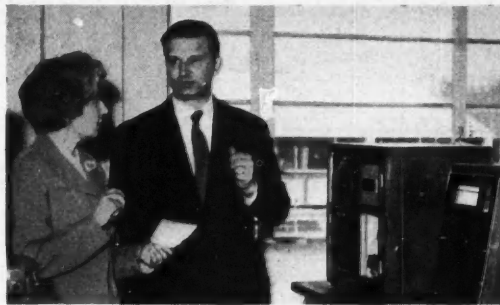
Among the first six Tinsley polarograph customers in 1942, were the Post Office Engineering Department, Dollis Hill, London N.W.2, the Admiralty's Bragg Laboratory, Jansen Street, Sheffield and Marconi Instruments Ltd., Herts. A year later, Burroughs Wellcome and the Ministry of Supply Armament research section, were among the company's customers and in 1944 the National Physical Laboratory and I.C.I. Dyestuffs Division had taken Tinsley polarographs. Since 1942, Tinsley's have produced some 10 models all with varying improvements.

The company are proud of their after-sales service to customers, since they were one of the first companies in this country to recognise the need for it. Also of value to the customer is the information service.

At present, the polarographic department is carrying out research on the bent capillary technique which has been proved on an empirical basis. Now work is proceeding on a fundamental basis, to enable a better understanding to be obtained of the fundamentals involved in the Ilkovic equation. This research follows the general line of research undertaken by Tinsley's since 1946.

The validity of the Ilkovic equation was discussed after a paper presented by

Mrs. B. Lamb, chief chemist of Evershed and Vignoles, with Dr. J. Masek in the new Tinsley laboratories, North Circular Road, West Twyford, London, N.W.10



Professor J. Heyrovsky, on 'Fundamental laws of polarography' (*The Analyst*, 1947, 72, 229), when F. Steghart said that experiments carried out had thrown some doubt on the matter. It was suggested that the equation described only part of the effect and that other factors, e.g. turbulence near the surface of the drop, might also play a part.

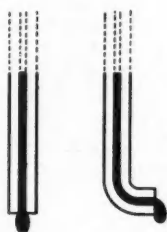
Cine-photographic experiments had indicated that the increase of the mass of the drop was not a linear function of the time and if this was taken into account,

reversible and irreversible reactions. Because of this, Tinsley's have concentrated on the development of different electrode systems, such as the pool electrode as well as the bent-tip capillary.

Results are now awaited of cine pictures of the drop formation on the end of the bent capillary as against drop formation on the straight capillary. The mathematical data derived from these pictures will be correlated, Tinsley's state, with present known theory and will be published in the near future.

In the chemical laboratories a series of tests are being carried out with the company's latest polarograph (MK/19). The instrument is being used to estimate levels of Pb and Zn, etc., occurring in pure chemical reagents for use in polarography and other forms of micro-analysis. Preliminary tests have indicated that at very high sensitivities, approximately  $0.2 \mu\text{A}$  F.S.D. and better, the impurities in normally supplied pure chemicals are discernible on the instrument. If greater instrumental sensitivity is demanded, the level of allowed impurities will have to be reduced by a factor of about 10.

Thus the Tinsley Laboratories continue to maintain and improve wherever possible the high standards set by the development of the first instruments by Tinsley. At the same time, they are contributing much fundamental research of value which should in time, lead to new equipment for the practical man.



Left, the capillary at present in general use. Right, the new capillary mentioned in this article

it increased the discrepancy between the actual record and the  $1/6\text{th}$  power law.

At that time (1947) it was suggested that further investigation into the basic theory of the polarograph would be of great interest and might lead to further improvement in the usability and accuracy of the instrument. The d.c. polarograph is still considered the most universally useful tool for chemical analysis, since it can be used for organic, inorganic

## List of Papers Continued

polarography,' by Professor J. Tirouflet and Mr. E. Laviron, Laboratoire de Chimie generale, Universite Dijon; 'The polarography of amidines,' by Dr. P. O. Kane, May and Baker Ltd., Dagenham, Essex; 'Polarographic determination of secondary beta-oxy ethylamines in amine mixtures,' by Dr. H. Berg, Deutsche Akademie der Wissenschaften Institut f. Mikrobiologie u. experiment Therapie, Jena; 'Determination of zinc and copper in biological material,' by Dr. K. O. Raeker, Agrikulturchemisches Institut der Universitaet Giesen.

On Friday, October 24, the morning session was devoted to theory and kinetics, under the chairmanship of Professor C. A. Knorr. The papers presented and discussed were:

'Theory of the polarographic wave,' by Professor F. von Stackelberg, Institut f. physikal. Chemie d. Universitaet Bonn; 'Investigations on polarographic maxima,' by Mr. R. Doppelfeld, Institut f. physikal. Chemie d. Universitaet Bonn; 'Current-time curves in micro-heterogeneous catalysis,' by Dr. H. Berg; 'Investigations into the catalyst of hydrogen evolution at the mercury electrode,' by Mr. H. W. Nurnberg, Institut f. physikal. Chemie d. Universitaet Bonn; 'Investigations of the catalytic wave of quinone derivative Bayer E 39,' by Dr. H. Wagner, Deutsche Akademie der Wissenschaften Institut f. Mikro-

biologie u. experiment. Therapie, Jena; 'On the polarographic determination of the rate of formation of undissociated acids from their anions and directly with reacting proton donors,' by Mr. M. Becker and Dr. D. H. Strehlow, Max-Planck Institut f. physikal. Chemie, Goettingen; 'Investigations using single drops in polarography for the elucidation of electrode processes,' by Mr. L. Holleck and Dr. B. Kastening, Institut f. physikal. Chemie d. Universitaet. Hamburg.

Biochemical and physiological investigations were considered in the final session under the chairmanship of Dr. B. Nygard initially, and later of Dr. O. Hockwin. Papers presented and discussed were: 'Polarographic determination of ascorbic acid,' by Dr. K. O. Raeker; 'Influence of the oxygen consumption of the eye lens by chemical and physical processes,' by Dr. O. Hockwin, Universitaets-Augenklinik, Bonn; 'Determination of oxygen in the aqueous humour of the eye,' by Mr. H. G. Neumann, Universitaets-Augenklinik, Bonn; 'On the polarographic activity of the serumucoproteins,' by Dr. E. Balle-Halears, Laboratoire d'analyses Medicales, Brussels; 'Polarographic investigations of dithio and di-selenic carbonic acids,' by Dr. B. Nygard, Pharmacia Ltd., Uppsala; 'Polarographic determination of DPN in ion exchange fractions' and 'Polarography of a sulphonium structure,' by Mr. S. Mann, Universitaet-Augenklinik, Bonn.

## Overseas News

### SEWAGE FROM E. GERMAN BUNA PLANT USED IN FRESH WATER CIRCULATION SYSTEM

**L**SCHILLBACH of VEB Chemische Werke Buna, Schkopau, says it has been possible to use liquid sewage from the gas-washing plant of the Schkopau carbide-producing installation and from the crude-gas washing plant of the acetylene works in the fresh water circulation of the Buna plant.

There are five main sources of fresh water for the plant's circulation needs, states Herr Schillbach. First, the cold- and rain-water channels, which carry primary cold water, rain-water and clarified human and other sewage. Secondly, sewage from certain manufacturing plants is collected and purified to become the so-called fabrication channel. Next comes water from semi-solid sewage—ashes from the plant's power stations, thick fabrication sewage and excess lime—which is concentrated into slag-heaps and rinsed with clean water. A certain amount of the drainage from these heaps could be taken into the fresh water circulation if necessary.

Fourthly and fifthly come the 'new' sources. In the case of the carbide plant, solids are removed and the resultant liquid treated with certain of the plant's waste acids to reduce its pH-content. Jet treatment is used to break up the liquid. In the acetylene plant sewage circulates in internal channels, during which circulation slaked lime is separated from it to be mixed with excess lime from other sources and pumped on to the slag-heap for drainage.

#### S. Korean Fertiliser Plant

Nearly completed is the \$40 million urea fertiliser plant at Chung Ju, on the Han River in South Korea. It will supply the country with 250 metric tons of urea a day—enough for nearly one-third of the country's food-growing needs. It will save also South Korea some \$10 million a year in foreign exchange by reducing fertiliser imports.

#### Polythene 'Rosettes' as Tower Packing

U.S. Army Corps of Engineers has found that helically-wound polythene strip formed into toroidal 'rosettes' make a lightweight sturdy, highly-efficient packing for cooling towers. It is claimed that these 'rosettes' give 20 to 40% greater cooling efficiency at a pressure drop only 35% that of conventional packings of equivalent size. An additional advantage of polythene as packing is that it is corrosion-resistant being unaffected by water and highly corrosive chemicals.

This 'rosette' packing has been used by the Army in a trailer-mounted water-cooling tower—part of a mobile carbon dioxide generating plant, and it has been

found that the packing not only resists completely the shock of rough riding, but has reduced the weight which must be transported. Weight of the polythene 'rosettes' is 10 lb./cu. ft. Suppliers are Harshaw Chemical Co.

#### New Aureomycin Plant for Cyanamid of Canada

Cyanamid of Canada Ltd. are to start construction soon on Canada's first aureomycin chlortetracycline plant. The new facilities, costing more than \$1 million, will be located at the company's present Welland plant between Niagara Falls and Welland, Ont.

#### Parke Davies to Expand

Parke Davies and Co., New York, are about to start an extension programme which will widen the scope of their manufacturing plants in the U.K., West Germany, France, Belgium, Spain and Italy.

#### Dow Chemical—U.S. Borax to make Boron trichloride

Dow Chemical Co. and U.S. Borax Research Corporation which have been engaged for some time independently on research on boron trichloride, are to engage in a joint venture to perfect an economic process for the manufacture of this boron compound. U.S. Borax Research is a subsidiary of U.S. Borax and Chemical Corporation, the U.S. operating company of Borax (Holdings).

#### Sincat's Fertiliser Plant in Sicily

The Edison Group subsidiary, Societa' Industriale Catanese, have built at Priolo Gargallo, Sicily, a plant scheduled to produce about 350,000 tons yearly of binary and ternary fertilisers with varying content of nitrogen, phosphate and potassium.

Sincat's primary task is to produce fertilisers, but in co-operation with another company, Celene, it will expand in the sector of general chemical utilisation of Sicilian minerals and petroleum.

#### Dutch Firm Opens New I.C.I. Polyester Fibre Plant

A new factory of the Algemene Kunstzijde Unie (A.K.U.), N.V., was officially opened at Emmen recently in the presence of H.R.H. Prince Bernhard of the Netherlands. It is to manufacture a new type of synthetic fibre and yarn, which is to be marketed by A.K.U. under the trade name 'Terlenka' (polyester fibre).

When the A.K.U. received from Imperial Chemical Industries Ltd. the right to manufacture polyester yarns and

fibres in the Benelux countries four years ago, a pilot plant was established which produced the first 'Terlenka' fibre in September 1955. In the autumn of last year construction began on a factory for large-scale production.

#### E.N.I. seek Far Eastern Markets for Rubber and Fertilisers

Signor Enrico Mattei, chairman of E.N.I., the Italian State hydrocarbons concern, is at present in Peking exploring the prospects of entering the Chinese, Russian and Polish markets. It is believed that the new Ravenna plant will provide an increasing surplus of synthetic rubber and chemical fertilisers, for which it has been found difficult to find customers in the west.

#### Kuhlmann-B.A.S.F. Group to Extend Production Programme

The German-French joint foundation of the Kuhlmann group and Badische Anilin-und Soda-Fabrik are to extend production programme by the addition of Styropor now that the manufacture of polymer emulsions based on acrylic esters has begun. Styropor is an expandable plastic developed by B.A.S.F. Foam materials of the material can be used in refrigeration, in packaging, engineering, etc. The Styropor plant in Villers St. Paul is planned to cover the whole requirements of the French Market. The plant will be erected at the site provided by the Compagnie Francaise des Matieres Colorantes.

#### Soc. Ugine's Carbon Black Plant in Production Soon

The French concern Société d'Electrochimie d'Ugine has announced that its plant at Villers-Saint-Sépulcre is to start producing 5,000 metric tons of carbon black annually, using Société des Produits Azotés manufacturing process. This company started to produce large quantities of carbon black in the summer of 1957. The Société Azotés will be responsible for selling Ugine's products in this field, which are destined for the rubber industry.

Ugine recently made an agreement with U.S. Rubber which granted the French company the exclusive right to produce certain types of nitrile rubber and other rubbers, amongst them Kralastic, a butadiene-styrene-acrylonitrile-copolymer.

#### Hungarian Chemists Develop New Corrosion-inhibitor

Hungarian research chemists are said to have perfected recently an evaporating rust and corrosion inhibitor which, because of a simpler manufacturing process, can be produced much more cheaply than the product introduced during the last war by the Americans and known as VPI. Sprayed on to metal as a white crystalline powder it quickly evaporates, leaving the surface covered with a uni-molecular film which ensures its resistance to corrosion. It has even greater effectiveness when impregnated in wrapping paper.



# AUTUMN GAS RESEARCH MEETING-4

## Survey of Effluents Produced in Gas and Coking Industries

USING a chromatographic method, Dr. L. Barker and N. W. Barker, Leeds University, have compared the concentrations of different phenols in ammoniacal liquors from a number of sources. In particular the procedure has been applied to the analysis of liquors from a number of gas and coke works in which phenols are the major organic constituents.

The work of these investigators was reported at the recent 24th Autumn Research Meeting of the Institution of Gas Engineers, which was also reported in *CHEMICAL AGE*, 29 November, 6 and 13 December.

**Determination of Phenols.** Three chromatographic columns are required, the Pyrex tubes being 19 mm. int. dia. Total length of the tube above a B10 cone should be 40 cm. for the one tube used for the addition of the liquor and 50 cm. for the other two. A B24 socket is attached to the upper end. The shorter column when in use requires an extension tube 25 cm. long. A siphon discharging about 5 ml. of eluate into successive tubes is used for collecting fractions. The support used for the stationary phase is Celite 535 (Johns Manville Co.) treated with hot HCl to remove iron and washed thoroughly with hot distilled water. Organic matter is removed by treating with hot alcohol, and the material dried in an air oven at 130°C.

### Celite Packing

Packing of the first column consists of 22 gm. of Celite with 11 ml. 0.1 NHCl. The Celite is placed in a 400 ml. beaker and the acid added dropwise with stirring. This is then slurried with spectroscopic cyclohexane previously saturated with water. A small plug of cotton wool is put into the constriction of the chromatographic tube which is closed with a tap and about 1/20 of the slurry poured in. The tube is filled with cyclohexane which is then run out through the tap when the Celite settles to a smaller bulk. By applying pressure from a blowing ball to the top of the column while the cyclohexane is running out, the Celite is compressed further. (The cyclohexane should not be allowed to fall below the upper level of the Celite). Further portions of the slurry are added and compressed in the same way. Lastly the Celite is compressed still further by a flat-ended glass plunger and a disc of filter paper is placed on the packing. In the two other columns, the stationary phases are solutions of sodium silicate, one being a 5% and the other a 20% solution. Both columns contain 20 gm. of Celite with

10 ml. of sodium silicate solution and are prepared in the same way as the first column.

To 100 ml. of liquor, pure HCl is added in 1 ml. portions until a drop of the solution reacts acid to an indicator paper. Decomposition of thiosulphate in the liquor produces a fine suspension of sulphur which settles on standing overnight.

In a 50 ml. beaker, 2 gm. of Celite is spread in an even layer on the bottom and 1 ml. of acidified liquor distributed dropwise over it. After stirring well, the material is transferred to the top of the first column, followed by rinsing the beaker and stirrer with cyclohexane. The Celite is then compressed with the glass plunger to form a plug about 2 cm. thick. Cyclohexane, previously saturated with water, is passed continuously through the column and consecutive 5 ml. fractions of the eluate are collected. Each eluate fraction is transferred to a 1 cm. thickness quartz cell and the optical density of the ultraviolet absorption of the solution is measured at the appropriate wavelength against pure cyclohexane in an identical cell.

### Monohydric Phenols

All monohydric phenols, except phenol, and any neutral oils are eluted in the first chromatographic band. Separation of the cresols and a partial separation of the higher-boiling monohydric phenols, is achieved by elution with cyclohexane on the column with 5% of sodium silicate as stationary phase. Further separation of the higher-boiling monohydric phenols may be obtained in the column with 20% of sodium silicate solution, entering successive tubes from the second column which contains phenols up to and including *o*-cresol. The columns are eluted with cyclohexane.

After elution of the first column, the plug containing the liquor is removed and the column freed from butanol by washing through with about 200 ml. cyclohexane. That which contains butanol is used again only with additions of butanol. The phenols are removed by extraction with sodium hydroxide solution and butanol by washing a number of times with water. Final purification is by distillation through a fractionating column.

Using an analytical procedure to be published elsewhere (*J. Applied Chem.* in press), phenolic constituents have been determined in a number of liquors taken from different types of carbonising processes. These include a low temperature installation, continuous vertical retorts, intermittent vertical chambers, a

horizontal retort, coke ovens, and the Lurgi generator at Dorsten in Germany.

Although phenols have been the primary concern of the present investigation, determinations have also been made of the inorganic constituents.

**L.T. Carbonisation.** One such liquor was obtained from Coalite and Chemical Co., Bolsover. Analysis showed that the amount of phenols was greater than the total amount of inorganic constituents. Phenol itself was present in greater proportion than any other phenolic body forming about one third of the total phenols. The rest of the monohydric phenols together comprise a third of the total, as do the total dihydric phenols. In the case of homologues, the total amount of isomeric groups is in the following order: monohydric phenols > catechols > resorcinols > quinols. The amount of monohydric phenols with nine carbon atoms cannot be determined from analysis but from the chromatogram it is considered that they must of necessity be small, except indanols and naphthols which would be eluted early in col. 3. Naphthols are eluted in a similar place to *p*-cresol, 1-naphthol just preceding 2-naphthol. Of the total catechol homologues, the total amount of isomers with seven carbon atoms is greater than that of the parent compound, and this is stated to be also true of the resorcinols.

**Continuous Vertical Retorts and Crude Liquor.** These liquors have been found to contain more dihydric phenols. Total concentration of a group of isomers is again in the order: monohydric phenols greater than catechols greater than resorcinols.

### Retort House Liquor

**Retort House Liquor.** The liquor is at a high temperature and contains a greater amount of the least notable compounds. Hence the concentration of ammonium chloride and dihydric phenols is high, while 'free ammonia' is small in amount. The amounts of monohydric phenols are similar to those in the crude liquor, but phenol and *o*-cresol show some reduction. Amounts of dihydric phenols are substantially higher and it is suggested that such a liquor would appear to be a better source of these compounds than a low-temperature liquor. Of total groups of isomers, catechols are now the major constituents and resorcinols are present in amounts similar to those of monohydric phenols.

**Hot Gas Electro-detarrer Liquor.** This gives a condenser liquor that contains very little dihydric phenols, but tends to result in an increased concentration of monohydric phenols. In these liquors, the catechols, which are more volatile than other dihydric phenols, form the greater proportion of such compounds. Except for reductions in the concentrations of the more volatile phenol and *o*-cresol, recovery of ammonia yields a

'spent liquor' in which the concentrations of other phenols are not very different.

**Intermittent vertical chambers.** The retort house liquor contains a high proportion of dihydric phenols, and the catechols can displace the monohydric phenols as major constituents.

In the primary condenser liquor the dihydric phenols are present in lower concentrations than in retort house liquor, although monohydric phenols are similar in amount.

As nearly all the phenols have been condensed in the previous stages, very little of these are apparent in a scrubber liquor. Only monohydric phenols are present with the more volatile in the greatest concentrations.

**Horizontal Retorts.** Compared with vertical retort liquors there is a substantial drop in the concentration of all phenols, particularly of dihydric phenols. This is due to the time of contact between the gas and the hot walls in the horizontal retort being greater than that in a vertical retort, resulting in more extensive thermal cracking of the phenols and also of increased reaction between the dihydric phenols producing more complex molecules. Concentration of 'free' ammonia appears to be greater than in vertical retort liquors, but 'fixed ammonia' is smaller.

**Lurgi Process Liquors.** Two liquors are obtained in the Lurgi process; the first separates from the tar—Teerwasser—and the second, separating from oil—Oewasser. These liquors are mixed at the works at Dorsten before extraction with butyl acetate to recover the phenols; ammonia is then obtained by distillation and the spent liquor finally discharged.

### Not Much Difference

Phenols in the tar liquor are stated to be not very different from some vertical retort liquors. The oil liquor is, however, richer in monohydric phenols, but contains relatively less dihydric phenols. It also has a high concentration of 'free' ammonia. The liquors are therefore not entirely different in character from those produced in gasification processes.

**Unidentified Material.** It had been observed previously, during separation of dihydric phenols on the first column, material was eluted in a band just before the position of 3-methylcatechol. However, further experimental work in the present investigation showed that the band could not be entirely ascribed to dimethyl- and ethylcatechols. Evidence is not yet sufficient to conclude that oxidised phenols are present in the elution band and amounts of material recovered from the band have so far been too small to allow identification by other means.

**Total Phenols and Pyridine Bases.** Procedures are given by Dr. Barker and Mr. Hollingworth for total phenols and pyridine bases. The ultraviolet absorption of phenols for quantitative determination of total phenols in liquors was investigated. By measurement of the optical density of the acidified liquor at

2,700Å and then at 2,750Å, it is possible, it is stated, to obtain an indication of the character of the liquor. The value at the longer wavelength will usually be the smaller, being about 10% less with liquor having small concentrations of dihydric phenols: with crude vertical retort liquors, the two values become nearly equal, while in retort house liquors the optical density at 2,750Å is usually the greater.

Extending the procedure determined for total phenols Barker and Hollingworth have found it possible to make an approximate determination of pyridine bases in a liquor, measuring the optical density at 2,560Å. Other organic bases will make some contribution towards the optical density at 2,560Å, but the method can at present be considered only to give a rough estimate of the pyridine bases.

**Conclusions.** The chromatographic method of analysis should be suitable for most analyses of liquors that should be

required, these workers state. If tars were to be analysed by this method then it is possible that a more extensive separation of higher-boiling monohydric phenols would be required. Improvement or replacement of the chromatographic separation of monohydric phenols on sodium silicate might be attempted.

The procedures given for total phenols and pyridine bases are only tentative, but the former is stated to appear to be reasonably satisfactory, 'being probably better than any at present in use, and should be capable of extension to separate determinations of monohydric and dihydric phenols.'

Oxidation of phenols in alkaline solution is noted as a phenomenon worthy of detailed consideration and as of interest to relate to the material that is not extracted from a liquor by ether. The nature of the eluate prior to 3-methylcatechol in the chromatographic analysis requires further investigation.

## New Segas Catalytic Plants for Reading

NOW under construction by Power-Gas Corporation for Southern Gas Board, at Reading, are two new Segas catalytic plants and a Gastechnik purifier installation of a capacity of 8 million cubic feet per day, complete with sulphur extraction plant. The whole plant installation is due to be completed next spring, and will improve the relation in the supply of gas throughout the Board's northern regions. Each of the plants will have a capacity of 3½ million cubic feet per day.

The plant has been designed to take any forms of feed stock. Primary elements in the design of the unit are a steam pre-heater, catalyst bed, air pre-heater, and vaporising chamber. The whole process is cyclic and the initial heating of the plant is by oil burners.

In operation steam is admitted to the base of the steam pre-heater in the superheater vessel and is passed upwards into the vaporising chamber where it meets and vaporises oil sprayed in at the top. The hot steam/oil vapour mixture then passes through the hot

catalyst and the gas formed passes downward through the air preheater before being further purified.

On completion of the make period a steam purge clears the plant and a blast of air is passed in the reverse direction through the plant which burns the deposited carbon and oil injected into the superheater and reactor vessels. This in turn brings the temperature up to conditions necessary to again produce more gas and so continue the cycle.

Purification takes place to cool the gas and get rid of heavy tar. The gas then passes to a scrubber where it is washed, and on to a naphthalene washer before going forward to an electric-detarrer where the last traces of tar are eliminated; hydrogen sulphide and benzole are then removed.

Essentially the plant for the extraction of hydrogen sulphide consists of cylindrical vessels 35 ft. high by 9½ ft. in diameter filled with pelleted iron oxide. When the pellets are fully charged with sulphur they are subjected to a solvent treatment and pure sulphur is recovered.

## Code of Practice for Rubber Linings?

THE newly formed Plant Lining Group of the Federation of British Rubber and Allied Manufacturers has set up a technical panel to consider the possibility of drawing up a code of practice for rubber and ebonite linings, which customers can specify at the time of ordering and thereafter rely on as a guarantee of quality in any work undertaken by members.

Members of the technical panel will be: J. Westhead, B.T.R. Industries Ltd.; J. T. Hull, Dextine Rubber Co. Ltd.; J. L. F. Crompton, Dunlop Rubber Co. Ltd.; H. L. Malan, Nordac Ltd.; H. Bridge, Redferns (Bredbury) Ltd.; C. H. J. Avons, St. Helens Cable and Rubber Co. Ltd.

The panel will welcome suggestions from designers and fabricators of chemical plant on points which a code of practice might usefully cover. Suggestions should be sent to the director, F.B.R.A.M., 43 Bedford Square, W.C.1.

### Details of Organotin Process

When the third annual Brussels tin conference, organised by the Belgian Office, Tin Research Institute, opened on 16 December, delegates keenly anticipated an address by Dr. C. R. Cramer, of Metalorgana, Vaduz, Liechtenstein, who it was thought would reveal details of the manufacturing process of organic compounds of tin.

**STONEWARE JOINTING CEMENT**

**CORRO-PROOF PX** cement, a new product developed by **Corrosion Proof Products Ltd.**, Sunleys Island, Great West Road, Brentford, is said to make possible chemical-resistant joints for glazed pipe-work. In recent tests at the laboratories of George Jennings of Parkstone, two 6 in. diameter pipes were jointed in glazed condition with this cement with a fillet of NL natural rubber latex cement. Cement and pressure was applied to conform to the requirements of B.S. 1143-1955. Pressure was then increased to the maximum obtainable with town water, 70-76 p.s.i. This pressure was maintained for about 1½ hours while a hand pump was introduced to enable a figure of 100 p.s.i. to be recorded. At this pressure—the maximum that the equipment and gauge could attain—there were no signs of leakage or failure on the part of either pipes or joints.

**PANORAMA 'FACE-SAVER' SHIELD**

**ADJUSTABLE** polythene headgear that is flexible, fitting snugly and securely to the head, is the new Panorama 'Face-saver' introduced by **Panorama Equipment Ltd.**, 29/36 Seymour Mews, Wigmore Street, London W1. It is adjusted by changing press-studs at the rear. The fibre spark-guard or chemical guard covers the front of the head. The



Panorama F.V.8 Face-saver

method of attaching the guard to the shield ensures a secure fitting. The screens, formed from Celastoid, a British Celanese product, are available in 6 in., 8 in. or 10 in. and can be obtained either crystal clear, or green anti-glare.

**ARKON FLOW RECORDER**

**LATEST** Arkon model 1602 flow recorder has been designed by **Walker Crosswell and Co. Ltd.**, Cheltenham, for the measurement of high pressure gas, compressed air, steam, water and other liquids. The instrument uses the principle of mercury U-tube and float, overload protection being incorporated. It is fitted with a dual valve, incorporating automatic equalising. These features eliminate the possibility of mercury being blown into the impulse lines due to incorrect operation of valves or surges of pressure. The operating valves are inside the recorder case and accessible from the front of the instrument.

# EQUIPMENT REVIEW

## Chemical Plant: Laboratory Apparatus: Safety and Anti-corrosion Products

The model 1602 has an easily read rectangular chart, ruled in straight lines. The visible width of the chart covers 16 hours, making it easy to follow the record over the whole of a normal shift. Where the instrument is required to total the flow automatically, an integrator can be fitted as an optional extra.

Charts can be supplied reading in cu. ft./hour, gall./hour, lb./hour, in. w.g., differential pressure or any units to meet requirements. Differential ranges from 60 in. to 200 in. w.g. model 1602 recorders are designed for operations under static pressures up to 300 p.s.i.

and the chassis is encased in solvent resistant plastics. Transparent plastics hoods shroud the tube trains against the ingress of dust. Auxiliary devices for rapid loading and unloading are also available.

This model is the production version of the 'continuous belt' concept shown for the first time at the 1958 Physical Society Exhibition. Other new B.T.L. equipment shown at Manchester, included a range of equipment for paper chromatography and comprised strip tank, multi-sheet tank, two-dimensional sheet tank, all-glass spray, drying oven, and desalting apparatus. This apparatus, with new electrophoretic tank and densitometer, and products under development, including a gas chromatograph and a centrifugal chromatograph, will be shown at the Physical Society Exhibition next month.

**B.T.L. FRACTION COLLECTOR**

**THE** B.T.L. fraction collector, employing new principles and avoiding the disadvantages involved with turntables and siphons, was introduced at the annual exhibition of chemical laboratory apparatus and techniques held by the Manchester and District Section, R.I.C., on 17 and 18 December, by **Baird and Tatlock (London) Ltd.**, Chadwell Heath, Essex. The model has a total fraction capacity of up to 600 fractions and a volumetric measuring range from 1 to 200 ml. per fraction. A disintegratable stainless steel belt carries a train of standard test tubes past a fixed filling point at which individual fractions are measured and decanted. A number of different tube sizes can be used with the same basic machine by simply changing the belts.

Fractions are measured volumetrically by a novel photoelectric device arranged to scan the liquid level of eluent accumulated in a calibrated glass vessel and to trigger the opposite-acting glass valves to discharge each measured fraction. A drop counting facility is also incorporated which may be used in conjunction with an electro-mechanical drop counter (available as a separate self-contained unit) to count from 1 to 9,999 drops per fraction.

Controls have been reduced to two

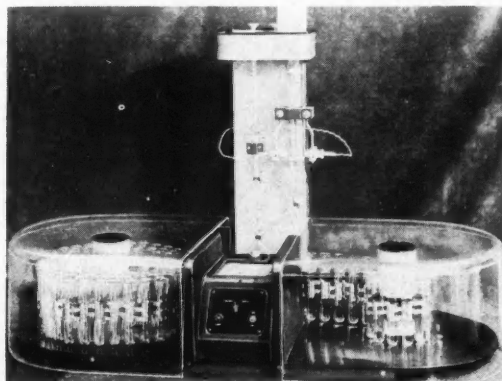
**POLYTHENE DISPENSING UNIT**

**A NEW** dispenser, 'Pressa-Flo,' for getting liquids out of bottles is manufactured by **Lee Plastics Ltd.**, Witton Lane, Hill Top, West Bromwich. It is made of polythene and consists of a bulb (constructed on the bellows principle) with a base that can be fitted firmly into any bottle opening, a length of polythene tubing to reach the bottom of the bottle and a delivery spout with an additional 4 ft. length of tubing.

Being made of polythene, the dispenser can be used with almost any liquid and in many trades, particularly in laboratories, especially for dispensing liquids with an unpleasant smell since the delivery tube can be directed straight to where it is wanted.

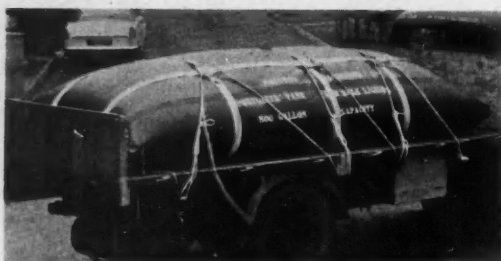
**PORTOLITE TANK FOR BULK LIQUIDS**

**A NEW** range of flexible containers, Portolite tanks, has been introduced by **Marston Excelsior Ltd.**, Wolverhampton, an I.C.I. subsidiary. Bulk liquids can



Fraction collector by Baird and Tatlock





**Portolite container when not in use can be rolled up in a small bundle, giving space for a return load**

be conveyed by normal road, rail or water transport. On the return journey the empty tank can be rolled up into a small bundle and the full load space used for other cargo.

'Portolite' tanks (see also *CHEMICAL AGE*, 23 August, p. 296) may be strapped on to the flat surface of an open sided vehicle or placed within the walls of a vehicle with sides; the walls should however be strong enough to withstand the loads imposed by the contents of the tank. Surge can be reduced to a minimum by ensuring that little or no air is allowed to enter the tank during filling. The tank is most stable when completely full; a partly filled tank should be suitably lashed.

The tanks are also suitable for 'on site' storage purposes. Their construction and flexibility enable them to be used on 'unmade' ground. When not in use, they can be stored without special packaging precautions. They can be supplied with filling and emptying connections to meet individual needs, the corner of the container being the most suitable place for the connection. The tanks are normally filled on the vehicle itself or on the site. Before filling, the tank should be fully rolled up to expel air. The method of cleaning depends on the contents of the tank. Steam and detergents may be safely used, while in some cases a second filling may help to dispose effectively of steam and condensate.

Due to widely differing requirements, the fabric of the Portolite tank will be governed by contents. These include: Mineral and vegetable oils, water, latex, chemical salt solutions, alcohols, detergents, molasses, alkaline solutions, ketones, esters and dilute acids.

#### **PULSOMETER DIATOMACEOUS FILTER**

**THE Pulsometer Engineering Co. Ltd.,**  
Nine Elms Iron Works, Reading.

have developed a filter for treating large quantities of fluids which, while giving a quicker rate of filtration than the conventional pressure filter, is said to produce better results and to occupy a smaller area.

This new filter employs elements coated with diatomaceous powder which will remove even the smaller suspended solids from water and by producing a clear effluent, reduces the need for chemical treatment. Organisms such as amoebae and algae which are difficult to filter out are claimed to be trapped by the filtering medium.

The Pulsometer diatomaceous filter is compact and operating costs are reduced to a minimum as the filter can be ser-

viced by unskilled labour.

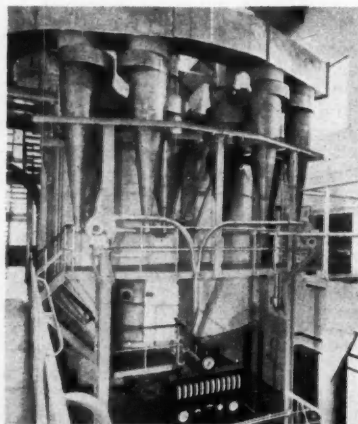
The equipment is available in four sizes ranging from a model with nine pairs of elements having a capacity of 1,290 gall. per hour to one fitted with 90 pairs of elements with a capacity of 12,900 gall. per hour. The elements are durable and resistant to most corrosive fluids. It can operate at continuously high rates of flow for long uninterrupted cycles.

#### **BERK'S RING JET SPRAY DRIER**

**THE ring jet spray drier of the Industrial Drier Division, F. W. Berk and Co. Ltd.,**

Berk House, P.O. Box 500, Portman Square, London W.1, now has a newly designed spray unit, air flow and powder collecting system. The spray is produced by a combination of centrifugal force and blast.

The liquid to be dried is fed through the centre of a low speed, low power, silent-running spray disc, mounted into the hollow shaft of an electric motor. The disc runs inside an air nozzle, so arranged that the nozzle outlet is the ring space surrounding the periphery of the disc. Thus, a ring jet blanket of



**A recent installation of a large Berk ring jet spray drier**

blast entrains the liquid film from the rim of the disc, forming it into droplets. Droplet size varies with intensity of the blast, which has the effect of blowing air bubbles out of the droplets, so that spray dried powders have low air content and correspondingly high bulk density.

The unit is arranged for vertical downward spray and the drying air is introduced into the drying chamber in vertical downward direction. Exhaust is at

the top so that the drying air flows downward in the centre of the chamber and upward again along the cylindrical wall. Chamber walls are kept clean because the pattern of flow carries the product down and away from the wall until drying is complete.

Cyclones for recovery of dried product are attached to the drying chamber roof. Two compact multicyclone units are mounted on opposite sides of the chamber. A slowly rotating vacuum chamber serves for discharging from the bottom of the drying chamber. From here and from the hoppers below the cyclone system all the powder is taken by a pneumatic conveying or cooling system to a final discharge cyclone, which can be remote from the drier.

#### **AUTOMATIC DRUM/SACK DISCHARGER**

**New automatic drum or sack lifting and discharging machines, recently introduced**

by **Service Engineering Co. (Northampton) Ltd.**, Weedon Road, Northampton, are designed for positioning near equipment into which goods are being discharged and can be permanently secured to it. It can also be supplied mounted on wheels to feed a number of hoppers.

Capacity of the standard drum model is up to 5 cwt. and it can be supplied with a lift height of 4, 5, 6 or 7 ft. Speed of lift and discharge is up to 12 seconds. The power unit is a 2½ h.p. totally enclosed fan-cooled electric motor directly coupled to the hydraulic pump.

Lifting arms are operated by independent hydraulic rams that can be actuated either independently or 'sequence interlocked' so that the lift and tilt mechanism may be separately controlled or be fully automatic.

#### **CONVEYOR FEED RATE INDICATOR**

**A NEW conveyor feed rate indicator calibrated to show the feed rate in tons or lb.**

per hour for a given belt speed has been introduced by the **Richardson Scale Co. Ltd.**, Cliff Quay, Nottingham. In view of the wide range of belt widths and speeds in use, each indicator is designed and calibrated for a particular conveyor. The unit can be fitted to either flat or troughed conveyors.

Weigh beam, of mild steel and fitted with self-aligning knife edges and supports, pulls into a cast-iron dial head that is cast iron and dust tight.

#### **SHAW RECORDING HYGROMETER**

**THE Shaw recording hygrometer has been developed by Shaw Moisture Meters, 31**

Market Street, Bradford, for checking the humidity of the most 'dry' gases used in industry, the 'dryness' of commercial drying plants and monitoring the dryness of packages, etc. The instrument gives full scale deflection for readings of 5% r.h. or less and gives warning of any increase in humidity in less than one second.

Sensing of moisture is done by a new type of small element, which is an im-

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proved version of that used with the first Shaw hygrometer announced earlier this year. This element consists of a capacitor with a hygroscopic dielectric only a few microns thick, covered with 24 carat gold.

The detector is contained in a small, strong, fine wire gauze protector, which plugs into a coaxial cable connecting it to the recorder. The detecting element is 1 cm. in diameter and 6 cm. long, and can be used with any length of cable. An element for use in industrial driers at temperatures up to 150°C is available.

WHAT is claimed to be the largest range of screw down p.v.c.

**TURBRO SCREW-DOWN P.V.C. VALVES** valves at present available from  $\frac{1}{2}$  in. to 6 in. bore, are now being produced by **Turner and Brown Ltd.**, Davenport Works, Bolton.

Turbro valves employ conventional metal bonnet assemblies incorporating neoprene, Hypalon or nitrile rubber diaphragms. The valve bodies are manufactured from Cobex p.v.c. and may be



Fibreglass container bonded with polyester resin

supplied with either standard or non-standard flanges, complete with mild steel backing rings.

The valves are chemically inert up to 70°C, and are virtually unbreakable. A unique feature of the design is the compression type p.v.c. flange and loose backing ring which enables the valve to be set at any angle.

Also newly available are containers manufactured from fibreglass and bonded with polyester resin for the storage and handling of corrosive and dangerous powders. The container illustrated measures 2 ft. by 2 ft. by 2 ft. 7 in. deep and was built to hold 900 lb. of uranium powder.

Turbro containers may be stored in the open, since the mild steel angle frame is completely sealed. The flange is moulded from fibreglass and employs a pressed p.v.c. cap which is secured by eyebolts and wingnuts, a neoprene gasket ensuring that the containers are airtight.

### Monopolies Report of Fertilisers Expected in Mid-1959

The Monopolies Commission report on the fertiliser industry will, it is expected, be presented to Sir David Eccles towards the middle of 1959. Sir David stated this in the House of Commons last week.

## TRADE NOTES

### Viscometer Demonstration

Ferranti Ltd. are holding a demonstration of the Ferranti-Shirley cone and plate viscometers and the Ferranti portable viscometer at the Computer Centre, 21 Portland Place, London W.1, on 19, 20 and 21 January. Visitors' own samples can be tested and the necessary solvents should be taken. Those intending to be present are asked to notify Mr. J. C. Heywood, Ferranti Ltd., Moston, Manchester 10, of time and date.

### Agreement on Lactic Acid

Bowmans Chemicals Ltd., Moss Bank Works, Widnes, have appointed Henderson Hogg and Co., 129 Whitefield Road, Glasgow S.W.1, as sole selling agents for the sale in Scotland of their lactic acid and calcium lactate. The agreement, effective from 1 January, also covers sulphonated oils and other tanning chemicals.

### New Analytical Solution

N/10 Lithium methoxide solution has been added to the range of volumetric solutions for titrations in non-aqueous solvents by the B.D.H. Laboratory Chemicals Division, Poole. New entries for the B.D.H. catalogue are: barium chloranilate (used in method for colorimetric determination of sulphates in water—Bertolacini and Barney (*Anal. Chem.*, 1957, 29, 281), said to be sensitive to as little as 2 p.p.m. of sulphate); 2-chloro-pyridine; 3:3'-diamino-benzidine tetrahydrochloride; 2:3 epoxy-propanol (glycidol) (which is employed in the production of water-soluble surface-active agents used for breaking water-oil emulsions, and which has been added to palm oil to reduce degradation during shipment); and phenyl-succinic acid.

### Croda Scottish Office

The new Scottish office of Croda Ltd., Goole, will operate from 5 January at Victoria Chambers, 42 Frederick Street, Edinburgh. The manager will be Mr. E. F. Miller, formerly northern representative.

### Baker Perkins-Triulzi Agreement

Following an agreement with A. Triulzi S.A.S., the leading Italian injection moulding and die-casting machin-

ery manufacturers, Triulzi machines will be built by Baker Perkins Ltd., Westwood Works, Peterborough. The Triulzi range of injection moulding machines includes units of from 1/6 oz. to 400-oz. capacity; the die-casting machines from 30 ton to 1,500 ton locking force.

### Ion Exchange Materials

The range of special grades of ion exchange materials for chromatography, first produced in quantity by the Permutit Co. Ltd., Permutit House, Gunnersbury Avenue, London W.4, at their South Wales chemical works a year ago, has now been extended. The new materials are: Zeo-Karb 226 (carboxylic resin of cross-linked polymethacrylic acid); De-Acidite G (weak-base polystyrene tertiary amine resin); and De-Acidite H (mixed-base polystyrene tertiary and quaternary resin). These are in addition to the existing Zeo-Karb 225 (polystyrene sulphonate acid resin) and De-Acidite FF (strong base polystyrene quaternary ammonium resin) grades. Altogether 68 grades of these materials are now available in different mesh sizes and cross-linkings, as well as the standard grades of Permutit ion exchange materials.

### Changes of Address

Manchester office of Durham Raw Materials Ltd. has been moved to Canada House, 3 Chepstow Street, Oxford Street, Manchester 1 (Central 2683). Durham Raw Materials, 1/4 Great Tower Street, London E.C.3, are the sales division of Durham Chemicals Ltd., Nuodex Ltd. and Durham and Bonny.

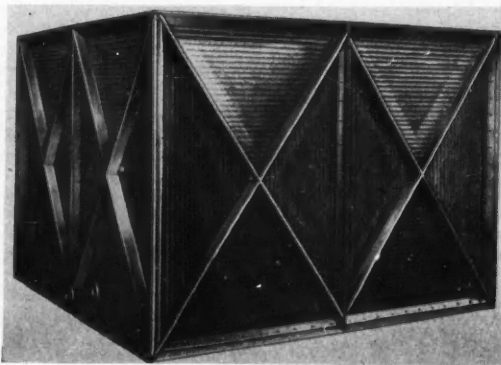
John Kimbell and Co. Ltd., suppliers of chemical machinery and plant, have moved to new premises near Vauxhall Station at 4 South Lambeth Place, London S.W.8 (Reliance 6711).

### Paz Chemicals Ltd.

Paz Chemicals Ltd., formerly the Shell Chemicals Distributing Co. (Middle East) Ltd. now have their registered offices at 1 Avery Row, Grosvenor Street, London W.1 (Hyde Park 9261); offices, 75 Grosvenor Street, W.1. The new board consists of Mr. I. Wolfson, chairman, Dr. J. Pomerancic, managing director, and S. Majaro and Mr. D. I. Young.

## Glass Storage Tank made from Duramat

This 15,000 gall. storage tank has been made, not from traditional materials, but from the new chemically bound chopped strand glass Duramat. Designed and fabricated by Turner Machinery Ltd., Leeds, to contain chromic acid, the glass tank is believed to be the largest so far produced for the tanning industry. Duramat is manufactured by Turner Brothers Asbestos Co. Ltd., P.O. Box 40, Rochdale



● Speaking recently at Blackpool, Sir ALEXANDER FLECK, I.C.I. chairman, referred to the fact that Sir EWART SMITH, a deputy chairman of the company and a former Billingham Division chief engineer, was to retire at the end of March next after more than 30 years with I.C.I.

● Dr. E. R. H. DAVIES, works manager for the past four years at I.C.I. Fibre Division's Terylene plant, Wilton, will become production manager at the division's Hookstone Road, Harrogate, headquarters, on 1 January. He will succeed Mr. C. D. RUTHERFORD, now engaged on full-time work for Fiber Industries Inc., U.S. New works manager of the Terylene plant will be Dr. J. Y. BAXTER.

● Mr. DENNIS PUNTON has been appointed manager of the Manchester office of Durham Raw Materials Ltd., at Canada House, 3 Chepstow Street, Oxford Street, Manchester 1.

● Mr. L. GRAINGER has been appointed head of the Metallurgy Division in the U.K. Atomic Energy Authority's research group at Harwell. He succeeds Dr. H. M. FINNISTON, who is being released by agreement to take up an appointment with the Nuclear Power Plant Co.

● Dr. T. L. COTTRELL, 35 years of age and personal assistant to Sir Ewart Smith, an I.C.I. deputy chairman, has been appointed professor of chemistry, Edinburgh University, to succeed PROFESSOR JAMES P. KENDALL, who retires at the end of September 1959. Born in Edinburgh, Dr. Cottrell gained his B.Sc. at Edinburgh University in 1943 and worked at the I.C.I. explosives research department at Ardeer from 1943 until 1946, when he was seconded to work in the Oxford University physical chemistry laboratory. He returned to Nobel Division in 1948 and in the following year became head of the physical chemistry research section. He was appointed head of section, blasting explosives re-

## PEOPLE in the news

search in 1955 and was transferred to the I.C.I. directorate staff in London as personal assistant to Sir Ewart Smith in January this year. Dr. Cottrell gained a D.Sc. (Edinburgh) in 1958 and was awarded the Meldola Medal in 1952 and the *Sunday Times* scientific essay prize in 1957. He is the author of 'Strengths of Chemical Bonds.'

● Mr. K. H. JOHNSTON, who joined Goodyear Tyre and Rubber Co. (Great Britain) Ltd., Wolverhampton, in 1957, after overseas appointments with Goodyear, has been appointed sales manager of a new General Products Division set up by the company to cover industrial rubber products, shoe products, films and adhesives, and chemical products. The appointment indicates the growing significance of the production of rubber products other than tyres at Goodyear's Wolverhampton factory. New products include Neolite stick-on soles, and rubber fenders for commercial vehicles, loading bays and domestic garages.

● Dr. WALTER STRAUS, D.ING., D.PHIL., A.M.I.E.E., who, as stated last week, has joined the board of Reichhold Chemicals Ltd., Beckacite House,

Edwards Lane, Liverpool 24, was born in Germany in 1890 and came to England in 1936. He became a founder director of Vinyl Products Ltd., Carlsholton, in 1939, and of Vinatex Ltd. in 1947. Dr. Straus is now finance and export director of each of these companies. Reichhold Chemicals were formed in 1952 and now comprise Vinyl Products, Vinatex, Beck, Koller and Co. (England) Ltd., Liverpool, and James Beadel and Co. Ltd. (both of Liverpool and London).

● Mr. HAROLD A. WHITE, general manager of the paper makers' chemicals department, Hercules Powder Co. Ltd., 1 Great Cumberland Place, London W.1, has been appointed to the board of directors from 1 January.

● Dr. J. I. M. JONES, technical manager and research director, Crookes Laboratories Ltd., Park Royal, London N.W.10, has been elected chairman of the Biological Methods Group, Society for Analytical Chemistry at the recent annual meeting. Mr. J. S. SIMPSON, Glaxo Laboratories Ltd., Greenford, Middlesex, was elected vice-chairman, and hon. secretary and treasurer is Mr. K. L. SMITH, Standards Department, Boots Pure Drug Co. Ltd., Nottingham.

● Mr. JAMES FRISKIN, B.Sc., who has been elected vice-president of the Fertiliser Society to succeed Mr. A. I. COLEMAN, has been

general manager, works, of the Fertiliser Division of Fisons Ltd., Harvest House, Felixstowe, since January of this year. Having gained his B.Sc. in technical chemistry at Edinburgh University and a diploma in chemical engineering, University College, London, he started his career as a chemical engineer with National Smelting Co., Avonmouth. Later he moved to Fuller's Earth Union as works manager of their activated earths factory. In 1947 he joined Fisons as works manager of their new Immingham factory for the production of triple superphosphate and compound fertilisers and in 1955 was transferred to head office as deputy works controller, Fertiliser Division. A member of the fertiliser executive, Association of Chemical and Allied Employers, he is also a member of the council, National Sulphuric Acid Association.



J. Friskin

## Styrene Co-Polymers' Sales Conference



Styrene Co-Polymers recently held an overseas sales conference at their laboratories at 1 Roebuck Lane, Sale, Ches, their head office, to launch the new styrenated alkyd resin, Scopol 55NM, with the company's north European agents. Seated (l. to r.): Erik Paulsen, Denmark; Emile de Smet, Belgium; R. C. Jacquemot, France; P. Doedens, Holland; E. A. Bevan, managing director, Styrene Co-Polymers; Dr. Backhausen, West Germany; E. Lorenz, West Germany; O. C. Holmen, Norway; S. Weintraub, Finland, and O. Sundstrom, Sweden. Standing are members of Styrene Co-Polymers' executive and sales staffs.

● Sir MILES THOMAS has been elected chairman of the British Productivity Council for 1959. Speaking to industrialists and trade union leaders at a meeting of the council this week, Sir Miles said that he found the prospect of being council chairman next year 'particularly exciting'. There was so much at stake.



## Commercial News

### Allen and Hanburys

Net profit attributable to Allen and Hanburys Ltd., is £200,333 as compared with £150,158 for the previous year. Profits before tax amounted to £438,112 as compared with £346,447. Profit, before charging interest and taxation increased by 21% from £418,050 to £504,900, mainly as a result of increased sales of the parent company and its principal subsidiaries.

The heavy expenditure on buildings and plant has made the financial position more difficult and these difficulties will continue for much of the current financial year. When the present heavy building programme is completed, however, the high rate of expenditure on fixed capital will fall. Of the merger with Glaxo Laboratories Ltd., Mr. John C. Hanbury, the chairman, reports that although it is early days yet 'the marriage has been a most happy one and a highly satisfactory degree of harmonious co-operation has been achieved.'

### Aspro-Nicholas

Chairman of Aspro-Nicholas, Mr. M. A. Nicholas, in his quarterly report, states that the results of trading for the September quarter are encouraging. A second quarter interim dividend of 6% is declared.

### British Glues

In view of current rumours, the directors of British Glues and Chemicals Ltd. have announced that they have no knowledge of any take-over affecting the company.

### British Tar Products

An interim dividend of 5% has been declared by British Tar Products on the doubled capital. The directors state, however, that this interim must not be taken as an indication that the total dividend distribution will equal last year's figure. There is reason to hope, they add, that the forecast as expressed in August last may be fulfilled, namely, a final dividend of 8½%, being the equivalent of the 17½% final paid last year.

For the year to 31 March last, there was a capital distribution of 5%, tax free, in addition to the total 27½% issued before the one-for-one scrip issue.

### Distillers Co. Ltd.

Group trading profit, after depreciation, of the Distillers Co. Ltd. is estimated at £12,894,000 for the half-year to 30 September 1958, compared with £11,360,000 for the corresponding period of the previous year. Group net profit, before tax, attributable to the company, rose by over £2 million (from £10,988,000 to £13,074,000).

- Heavy Capital Expenditure by A. & H.
- Higher Half-year Profits for Distillers
- Conditions Difficult, say Anglo-Lautaro
- Chemstrand Corp. Pay Initial Dividend

Final results for the year, Distillers state, should prove satisfactory, and any setback in the earnings of the industrial group, due to unsettled conditions and increased competition, will be more than compensated for as a result of increased sales of Scotch whisky.

An interim of 7½% (same) is declared on the existing capital for the year to 31 March 1959. This is equal to 4% on the capital as increased; the total for the year to 31 March 1958 was equivalent to 10½% on the increased capital.

### British Benzol

Final dividend of British Benzol and Coal Distillation of 5% for the year ended 31 October is being paid out of past profits. The board state also that in view of the current trading conditions the company is unable to make a dividend forecast for the current year.

### Anglo-Lautaro Nitrate

Prospects of Anglo-Lautaro Nitrate Corporation for the current year ending 30 June 1959 indicate an increasingly difficult competitive condition. Prompt action by the Chilean authorities will be required to remove the burdens now resting on the industry and, in particular, the penalisation of earnings through unrealistic foreign exchange rates. The industry is also suffering from excess productive capacity of the synthetic nitrate producers and the resultant weakening of world prices has created a challenge. The announcement by the

new administration of a new economic programme offers hope, it is stated, that the present conditions will soon be corrected.

### Chemstrand Corp.

An initial dividend of \$5 million has been paid by Chemstrand Corporation to its parent firms—American Viscose Corporation and Monsanto Chemical Co. Monsanto's share of the dividend is equal to about 11 cents per Monsanto share. This is stated to be equal to about one month of Monsanto's recent earnings from their own operations.

### Shawinigan Chemicals

A noticeable increase in the sales volume of Shawinigan Chemicals Ltd., and subsidiary and associated companies towards the end of the third quarter of 1959 resulted in an improvement in third quarter sales over the previous two quarters. This improvement is expected to continue in the fourth quarter and the outlook for 1959 is reported as better.

### INCREASES OF CAPITAL

DARLINGTON CHEMICALS LTD., Cockerton, Darlington, Co. Durham. Increased by £250,000 beyond the registered capital of £1,000,000.

DIVERSEY (U.K.) LTD., chemical substance manufacturers, etc., 17 Throgmorton Avenue, London E.C.2. Increased by £290,000 beyond the registered capital of £10,000.

## Market Reports

### MORE ATTENTION TO CONTRACT RENEWALS

**LONDON** Activity in industrial chemicals has been reasonably good for the time of year with home buyers giving more attention to contract renewal business. Although there is a reluctance to return to long-term bookings the position could easily change in the new year if the recently improved trend were sustained. Apart from non-ferrous metal compounds, prices are steady at recent levels.

Pitch, crude tar, creosote oil, and cresylic acid are all in reasonably good demand on a steady coal-tar market.

**MANCHESTER** The price position of the alkalis and most other heavy chemical products on the Manchester market has been well maintained. Fresh business, however, is already slackening off, although both home and export movements against existing commitments have generally been fairly steady.

Traders are anticipating a resumption of replacement buying early in the new year, but so far as the textile and allied outlets are concerned the prospect of any marked improvement in the demand for chemicals is not regarded very hopefully.

**GLASGOW** A reasonable week of activity is reported from the Scottish heavy chemical market and demands were maintained at a steady level. Quantities were well up to normal consumption and applied equally against spot and contract. There was also a good volume of inquiries, particularly for forward requirements with emphasis on those for 1959.

Although some variation in prices took place most remained more or less firm.

The export market continues fairly satisfactorily, while agricultural chemicals are seasonally quiet.

# NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sale Branch), 25 Southampton Buildings, Chancery Lane, London WC2, price 3s 3d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

## AMENDED SPECIFICATION

Copies on Sale 14 January

Porous shaped articles true to shape and size from synthetic thermoplastic materials. Badische Anilin- & Soda-Fabrik (I.G. Farbenindustrie AG. "In Auflösung"). 719 729  
Pelletising wet or sludge-like raw materials. Metallgesellschaft AG. 726 243

## ACCEPTANCES

Open to public inspection 21 January

Preparation of aromatic compounds containing mercaptomethyl groups. Henkel & Cie. G.m.b.H. 807 720  
Pyrolysis of ethane. Fowler, F. C., and Seay, J. G. 807 661  
Carbon impregnated oxide ores and method and apparatus for preparing same. Gulf Research & Development Co. 807 884  
Pharmaceutical compositions. Imperial Chemical Industries, Ltd. 807 772  
Coatings on metal. Du Pont de Nemours & Co., E. I. 807 914  
Chemical Processes. Imperial Chemical Industries, Ltd. 807 885  
Substituted hydantoins and thiohydantoins. Imperial Chemical Industries, Ltd., Brimelow, H. C., and Vasey, C. H. 807 678  
Substituted hydantoins and thiohydantoins. Imperial Chemical Industries, Ltd., Brimelow, H. C., and Vasey, C. H. 807 679  
Therapeutically useful diamines. May & Baker, Ltd. [Addition to 761 888.] 807 618  
Carbide composition and procedure for making. Firth Stirling, Inc. 807 769  
Manufacture of indole derivatives. Imperial Chemical Industries, Ltd. 807 620, 807 875, 807 876, 807 877  
Manufacture of barbituric compounds. Pharmacia A.B. 807 824  
Process of producing cyclodiene monomers from polymer-containing streams. Esso Research & Engineering Co. 807 800  
Process for carrying out catalytic reactions with platinum metal sols. Deutsche Gold- und Silber-Scheideanstalt vorm Roessler. 807 825  
Production of phosphate and thiophosphate esters containing a heterocyclic nitrogen ring. American Cyanamid Co. 807 682  
Derivatives of pyrimido-[5, 4-d]-pyrimidine and production thereof. Thomae G.m.b.H. Dr. K. 807 862  
Production of motor gasoline. British Petroleum Co., Ltd., Housam, E. C., and Lester, R. 807 583  
Solid pharmaceutical compositions. Imperial Chemical Industries, Ltd. 807 683  
Purification of commercial hydrogen and the production of methane. Engelhard Industries, Inc., formerly Baker & Co., Inc. 807 584

Process for colouring and fortifying food consisting of or containing fatty materials. Eastman Kodak Co. 807 865  
Process for maintaining the efficiency of phosphating baths at room temperature. Montecatini Soc. Generale per l'Industria Mineraria e Chimica. 807 730  
Stabilised phenol-formaldehyde resins. Monsanto Canada, Ltd. 807 622  
Production of N-alkyl aromatic amines. Farbenfabriken Bayer A.G. 807 623  
Treatment of effluent liquors. North Western Gas Board. 807 916  
Method of extracting deuterium from hydrogen-containing gases. Constructors John Brown, Ltd., formerly Costain-John Brown, Ltd. 807 803  
Hydrogenation of a solid carbonaceous material. Texaco Development Corp. 807 887  
Production of filaments of synthetic polymers. Shaw, G. 807 804  
Preparation of nickel hydrogenation catalysts. Maxted, E. B. 807 733  
Process and apparatus for separating mixtures of solid substances into fractions according to specific gravity. Stamicarbon N.V. 807 624  
Photographic developers. Imperial Chemical Industries, Ltd. 807 899  
Lubricant composition. California Research Corp. 807 626  
Oxidation resistant lubricant compositions. California Research Corp. 807 735  
Stabilisation of phenols. Imperial Chemical Industries, Ltd. 807 736, 807 901  
Mineral oil compositions. Esso Research & Engineering Co. 807 737  
Hydrolysing of starch and other polysaccharides. Werkspoor N.V. 807 807  
Detergent compositions. Hedley & Co., Ltd., T. 807 586  
Thermoplastic moulding powders. Monsanto Chemical Co. 807 686  
Catalyst and process for production of olefin polymers. Phillips Petroleum Co. 807 628  
Derivatives of quercetin and processes for their preparation. Recherches et Techniques Appliquees. 807 902  
Production of polymers and copolymers. Beck, Koller & Co. (England), Ltd. 807 739  
Reduction of titanium oxides. Farbenfabriken Bayer A.G. 807 889  
Phenoxazone-dicarboxylic acid derivatives. Farbenfabriken Bayer A.G. 807 687  
Preparation of monomeric glycol terephthalates. Hercules Powder Co. 807 630  
Block copolymers of formaldehyde and process for preparing same. Du Pont de Nemours & Co., E. I. 807 589  
Preparation of organic salts of the rare earths, with good solubility in water, which possess an inhibitory action on blood coagulation. Petrik, W. 807 590  
Polyurethanes. Union Carbide Corp. 807 808  
Production of cystine. Recherches et Propagande Scientifiques. 807 849  
Bis-amino and N-acylated amino ethyl disulphide compounds. Recherches et Propagande Scientifiques. 807 850  
Process of producing asparagine. International Minerals & Chemical Corp. 807 689  
Methods of treating silicon-iron alloys. Vacuum-schmelze, AG. 807 809  
Impregnation processes. General Electric Co. 807 746  
Derivatives of 3-hydroxy-anthranilic acid. Farbenfabriken Bayer AG. 807 890  
Disperse dyestuffs of the anthraquinone series. Sandoz Ltd. 807 591  
Extrudable polyethylene compositions. Union Carbide Corp. 807 664  
Preparation of polyvinyl chloride. Bataafsche Petroleum Maatschappij N.V., De. [Addition to 784 283.] 807 634

Black vat dyestuff of the violanthrone series. General Aniline & Film Corp. 807 595  
3,6-Di-n-propylcatechol and its use in preventing premature gelation in polymerisable materials. Pittsburg Plate Glass Co. 807 636  
Unsymmetrical dimethylhydrazine. Metalectro Corp. 807 748  
Substantially anhydrous ferrous fumarate and a method of preparing same. Mallinckrodt Chemical Works. 807 638  
Manufacture of O-aryl O-lower alkyl phosphorochloridothioates. Dow Chemical Co. 807 598  
Aldehyde diacrylates and process for producing same. Union Carbide Corp. 807 907  
Detergent in powder form with a base of non-ionic detergent components. Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. 807 640  
Polyoxyethylene glycol carboxylic acids. Imperial Chemical Industries, Ltd. 807 666  
Haloalkoxyalkyl esters of  $\alpha$ ,  $\alpha$ ,  $\beta$ -trichloropropionic acid. Dow Chemical Co. 807 599  
Tetra-acetyl mucyl-N, N'-bis-amino-monocarboxylic acid dialkyl-esters and tetra-acetyl mucyl-N, N'-bis-amino-dicarboxylic acid tetra-alkylesters and their preparation. Geigy AG, J. R. 807 601  
Conversion of synthetic drying oils to thermosetting resins. Esso Research & Engineering Co. 807 749  
Production of alkylated heterocyclic compounds. Farbenfabriken Bayer AG. 807 668  
Corticotropin reaction complexes. Lilly & Co., E. 807 692  
Treatment of granular materials by contact with a gas. Bronswerk N.V. 807 669  
Preparation of mono-vinylaryl hydrocarbons. Dow Chemical Co. 807 603  
Phthalides. Dow Chemical Co. 807 908  
Anti-rust compositions. Esso Standard Soc. Anon. Francaise. 807 670  
Plant-treating compositions. Amchem Products, Inc. 807 694  
Preparation of alpha, beta-epoxypropion aldehydes. Bataafsche Petroleum Maatschappij N.V., De. 807 605  
Chromium complexes of benzene mono-azo pyrazolone dyestuffs. Sandoz Ltd. 807 675  
Process for the preparation of  $\alpha$ -acylamino nitriles. Dornow, A., and Lüpfer, S. 807 606  
Piperazine derivatives. Soc. Des Usines Chimiques Rhone-Poulenc. 807 750  
Water-insoluble monoazo dyestuffs of the benzene-azo-benzene series. Sandoz Ltd. 807 696  
Polyhydric alcohol esters of 2, 2, 3-trichloropropionic acid. Dow Chemical Co. 807 697  
3, 4-Dihydro-2H-1, 3-benzoxazines. Dow Chemical Co. 807 698  
Bis-phosphoro-amidothioates. Dow Chemical Co. 807 610  
Surface treatment and cold-working of metals. Amchem Products, Inc. 807 660  
Tertiary amines and their salts and process for their preparation. Thomae G.m.b.H. Dr. K. [Divided out of 802 723.] 807 835 & 807 836

Open to public inspection 28 January

Processes and apparatus for effecting heat-exchange between gases and solid particles. Smith & Co. A.S., F. L. 808 204  
Measurement of moisture content of granular materials. National Research Development Corp. 807 993  
Producing a red dye for colouring edible matter. Oetker, G.m.b.H. Dr. R. 808 122  
Process for producing fast yellow dyes on textile material of aromatic polyesters. Farwerke Hoechst A.G. 808 174  
Cupriferrous disazo-dyestuffs derived from diphenyl and process for their manufacture. Ciba Ltd. 808 063  
Preparation of trithiones and lubricating oil compositions containing trithiones. Standard Oil Co. 808 064  
Production of dicarboxylic acids. Ruhrchemie A.G. 808 124  
Methods of crystallisation. Imperial Chemical Industries, Ltd. 808 176



"VULCAN"

BRAND

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LOSTOCK GRALAM, NORTHWICH, CHESHIRE.

IRON AND STEEL CARBOY HAMPERS  
SAFETY CRATES, PACKED CARBOYS

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